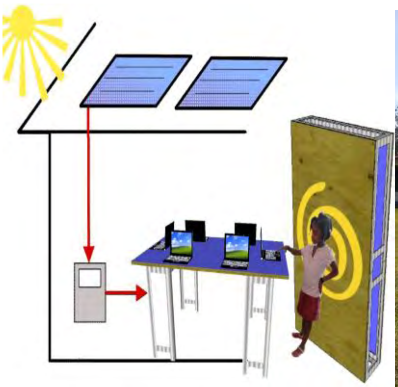

PS 385: Field Methods
Creating a Technology Readiness Site Survey

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Abstract

The following report contains detailed documentation of the work carried out by IIT students of PS 385: "Field Methods" on the creation and implementation of a baseline site survey to measure technology readiness of schools in the developing world. This project was worked on over the course of one academic semester and represents a positive step forward in the field of information and communications technology for development (ICT4D) within the realm of education. The report contains a background and overview of the project, followed by methodology, an overview of the technology used, and the challenges faced. The report then includes a discussion on data evaluation and closes with the team's insights and recommendations for future work on this project.

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Intro

Childhood education has a major role to play in the development of nations around the world. Education is the force behind much social and economic growth by providing children with opportunities to access greater knowledge, gain new skills, and to subsequently break through barriers imposed by the past. Although the condition of childhood education has been improving around the globe, a reliable education system is still lacking or non-existent in many places, and the use of technology in the classroom is still apparently low. Technology, in the form of computers, tablets, and other devices, along with access to the internet, has the potential for wide-reaching impact in the improvement of global education. Information and communications technologies have been shown to improve the life situations of people in the developing world, but technology alone is not the solution. Technology is essentially a tool; it cannot merely be dropped into a third world nation and expected to solve the complex problem of development. For technology to be an effective catalyst of change and improvement, it must be incorporated and used in the right way for the right purposes. For technology to be effective, researchers and donors must see the bigger picture, the whole scenario, and consider every element that could affect the outcome.

Though there have been many initiatives to bring computer technology to countries in need of the advancement tool, there has not been enough thorough research done into determining which schools are actually ready for technology. This presents the fundamental problem and opportunity for the Field Methods team. A school's readiness for technology is the first thing that must be evaluated, and involves the capability of keeping the technology safe and secure, the motivation to learn and use it, and the potential to benefit from its implementation. That being said, how does a team in the United States go about evaluating the technology readiness of a school on a remote island somewhere in the Pacific? The answer to this question can be found in the form of a baseline site survey.

With a vast distance to communicate across and cultural differences to consider, such a baseline survey must be carefully crafted to ensure the greatest level of understanding and transparency. By definition, a "baseline" refers to measurements of key conditions (indicators) before a project begins, from which change and progress can be assessed (IFRC, pg 2). With the overarching goals of a baseline survey established and awareness of the challenges ahead, the Field Methods team set out to make its own version of such a survey, utilizing mobile devices and the internet to determine the technology readiness of schools in the developing world. The following project report details the learning experience, methodology, challenges, and tangible results of the efforts which ensued.

Background

Origins for this project can be traced back to an interprofessional project (IPRO) course at IIT called SCLiaB, which stands for Solar Computer Lab in a Box. This course was tasked with creating a solar computer lab and sending it to a school overseas to be used. A school in the island state of Chuuk, in the Federated States of Micronesia, was to be the recipient of this technology. Construction of the lab and placement in the school went according to plan; however, the technology did not end up getting used, even with a set of instructions and communication with the school. Professor Laura Hosman, an experienced scholar within the field of ICT4D and faculty leader of the IPRO, after assessing the shortcomings of the first solar computer lab placement, made it a point to lead another social science course whose sole objective would be the creation of a baseline site survey. Therefore, the PS 385: Field Methods project arose as a result of the challenges faced by the SCLiaB IPRO and is essentially a branch of the same project, just with different goals and a broader perspective.

Project Overview

The Field Methods course was set up very similar to how an IPRO course is structured; a small team of students from various background and cultures and across diverse academic disciplines coming together to work on a project with real-world implications. The real-world aspect of this project regards improving the quality of education in the developing world, not just in Chuuk, but potentially all around the globe. The main goal of the Field Methods team was to compose a technology readiness site survey that would determine a school's capability to house a solar computer system. Ideally this baseline survey could have a factor of universality and could potentially be used in many different areas to evaluate existing conditions. The importance of a baseline survey which measures technology readiness is that technology can be placed more strategically, resulting in a greater positive impact and an enhanced educational experience for the recipient students.

For this project, the team maintained its partnership with Chuuk, which is one of the four states that compose the Federated States of Micronesia (FSM). The FSM consists of 607 total islands strewn about the Western Pacific that maintain an average temperature of around 87 degrees Fahrenheit year round. Chuuk is the most populous of the states, and is home to 11 main lagoon islands and 14 surrounding atolls and lower islands. The FSM is said to have one of the youngest populations of Pacific Island history, with a median age of 18.9 in 2000. According to the International Labor Organization classifications, the unemployment rate in the FSM in 2000 was 22%. Also interesting about the FSM is its Compact of Free Association relationship with the United States, which provides for U.S. economic assistance to the FSM in exchange for U.S. defense and other operating rights in their states. This also includes free access to the U.S. for work, schooling, and joining the military. Such access to the U.S. has resulted in high immigration rates.

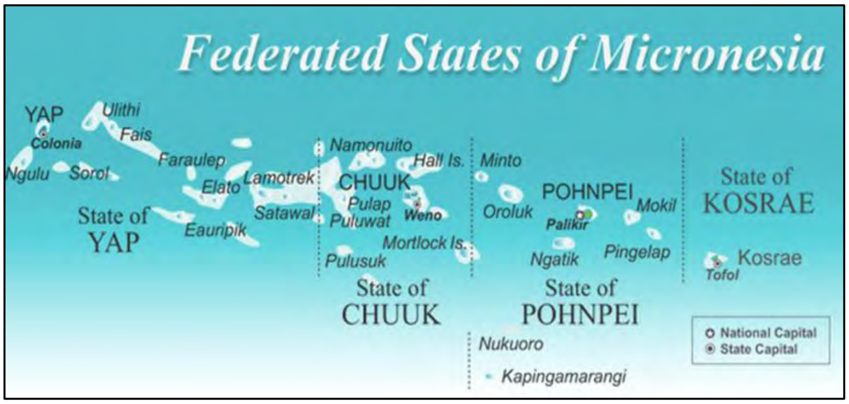

Figure 1: Map of the four states of FSM

Transportation and communications are also impacted by the geographic location and distribution of islands in the FSM. Air travel is costly with international connections only at the main island in each state. Transportation between the smaller islands of each state is erratic via ocean going field trip vessel or special charters. It can be months between stops at outer islands with limited time for each stop. Telecommunications is provided primarily by the FSM Telecommunications Corporation. Costs tend to be high and provided primarily on the main islands in each state. Fiber became available in Pohnpei in April 2010, but high cost of bandwidth and limited distribution schemes have limited its impact. Satellite services continue to be provided to Chuuk, Kosrae and Yap. There have been discussions regarding opening up the telecommunications to more than one service provider.

Reliable electrical power is an issue in all states. Chuuk has had long standing power generation and reliability problems on Weno and Pohnpei island power generation has been becoming more erratic in 2009/2010. Kosrae and Yap (Main Island) have had more reliable power generation. Major problems with power are seen in Chuuk lagoon islands and all outer islands. Bright spots for outer islands power generation are in the EU solar systems being put in place on selected islands, and power generation system on some of the outer islands of Yap. It is important to keep in mind that economic growth is being driven by information technologies around the world. While ICT cannot assure increased cognitive skills development in students, when applied in a matter that enhances and expands the learning experience, ICT can be a major driver of change in school systems. The digital divide is real and growing in the FSM. Few students, teachers, and schools have access to the Internet for learning and improved teaching. This is why our loyalty has remained in Chuuk to try and achieve the technology readiness survey.

TR Mori was the main contact in Chuuk. TR heads up the only internet cafe in Chuuk and is founder of iSolutions, a computer networking and consulting business located on the island of Weno, the capital of Chuuk. The iSolutions team was tasked with carrying out the surveying at schools in Chuuk. TR and his staff were beyond essential as their local insights and reach made it all the more possible for Chuuk to be of access to us. Additionally, our partnership with Inveneo helped us to solidify things during this process. We wanted to administer this survey utilizing mobile technology for gathering and evaluating site data, so Inveneo provided our team with android tablet devices to help with testing and administration. Inveneo's continued questions, input, and wealth of knowledge that they freely lent to our team ultimately continued to inspire our desire to help move global development forward by way of an efficient and accurate baseline survey process.

Figure 2: School in Chuuk

Methodology

The course began with a project debriefing and an introduction to baseline surveys. The team was then introduced to Bruce and Matt of the Inveneo team, who supplied the Google Nexus tablets and were kept in fairly consistent contact. The team received background on Chuuk and the situation there, and were introduced to TR Mori, who is leading the survey team in Chuuk. The next phase of the project consisted of assessing the available mobile survey technology platforms, learning how they work, and choosing which to use for the baseline. These include ODK Collect, Formhub, and Google Apps Engine. The more technically-inclined students worked closely with the technology, while the rest of the team was given other tasks. The team then focused on the survey itself; which questions to ask, survey length, format, and functionality. Compilation of the survey questions was a collaborative process which took place over the course of many weeks. The team meticulously went through each question, determining the skip logic to be used, the order and category of the questions, and how to appropriately word the questions for maximum understanding. The survey went through many changes and iterations before a 'final' survey version was ready.

The official name of the baseline survey is the "readiness for technology" survey. The survey forms are split into two main parts. The first part is intended to be answered by an administrator of the school and is mainly concerned with the infrastructure of the school. The second part of the survey is to be answered by a teacher or teacher(s) and is directed toward measuring the human side of things, such as experience with technology and attitudes toward technology.

Upon uploading the first version of the survey to the server, the team began the testing phase, which occurred locally in Chicago. IIT students (including many of international origin), staff, family members, and friends were given the survey, assuming the role of administrators and teachers in the developing world, and then asked to provide feedback on the survey. Subsequent changes were made to the survey over the next few weeks to improve user friendliness and functionality, and an instructional document was made to assist in the implementation of the survey via mobile Android devices. The instructional document can be viewed in Appendix A.

A revised and refined version of the survey along with the instructional document and other explicit instructions were then sent to the iSolutions team in Chuuk to begin surveying schools. The first round of data collection and analysis then commenced.

While the team in Chuuk was gathering survey responses, the Field Methods team was working on developing a data evaluation metric for the incoming data. Such a data evaluation metric was developed through collaboration by the entire team and then handed over to a sub-team who then carried out the actual analysis. The evaluation metric consists of four main categories or attributes for evaluation. These attributes are potential impact, infrastructure, experience, and attitudes, and each correspond with a different set of survey questions. All of these attributes should be weighted equally for each school, with a total "score" being evaluated at the end of the process and compared with the other schools' scores. (See fig. 3)
In the waning weeks of the semester, the Field Methods team was split into sub teams to prepare the final presentation, the final report, and the results from the data collected.

So far, five versions of the readiness for technology have been created, with the fifth (v1.5) being the most up to date and the iteration currently being used. The Google Drive application was used extensively throughout the duration of the project. This allowed the team to keep an up to date and organized collection of digital documents which together make up a digital project archive (See fig. 4). Collaboration via Google Drive was critical to the flow and success of the baseline survey project.

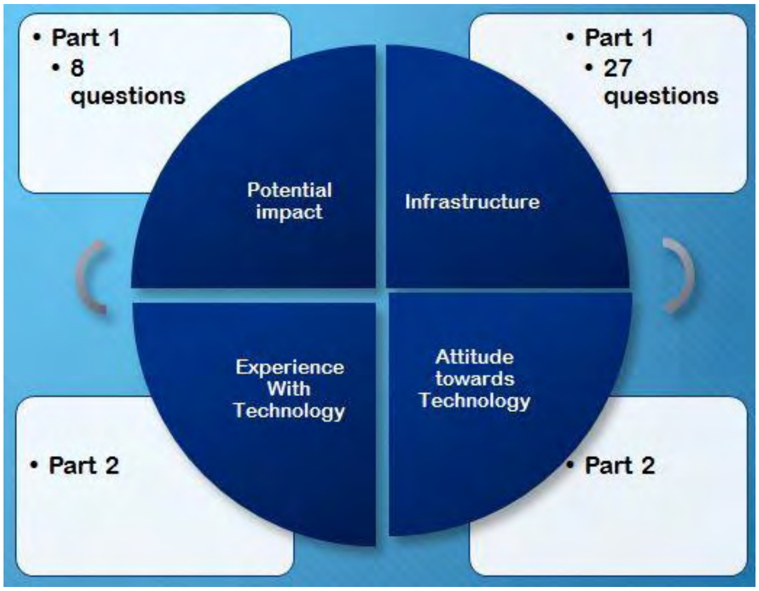

Figure 3: Data evaluation metric; showing the four attributes and corresponding survey parts and questions

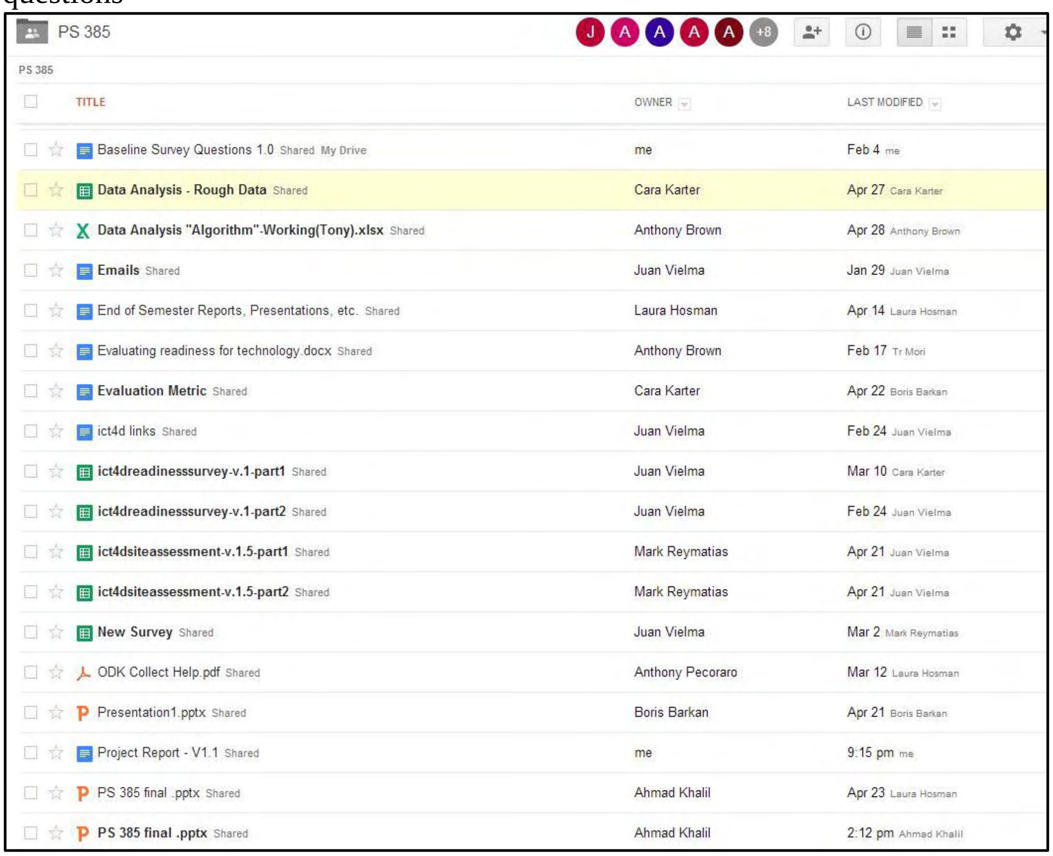

Figure 4: A screenshot showing most of the Google Documents created and worked on during the semester

Survey Technology

Overview

In this semester-long project, the team had adopted a complimentary and open-source set of gadgets to assist the team in achieving the goal of building, collecting, and compiling the data required for this project to be effortless and paperless. Tools such as ODK Collect, ODK Aggregate and Formhub are endorsed in this project and each of them has their advantages over other applications as well as their own shortcomings. Among these open-source tools, the team found one that matches the needs of this project, which is the ODK suite (ODK Build, ODK Collect and ODK Aggregate).

The team that created the tools of Open Data Kit (ODK) began developing for public use in April 2008, based in Google's Seattle Offices as a Google.org sponsored project. The first team consisted of three developers, Bill Schilit of Google Research, Adam Lerer of the Massachusetts Institute of Technology (a Google Intern), and Julie Chin of Google.org. Soon afterwards, University of Washington Computer Science and Engineering (UWCSE) graduate students Carl Hartung, Yaw Anokwa and Waylon Brunette joined the team, eventually basing the development of ODK in the University of Washington by September 2009. Currently, the core developers of the Open Data Kit are UWCSE graduate students and a UW based multi-disciplinary group named Change, but ODK is open to development efforts from the public domain.

Figure 5: Survey Interface in ODK Collect

Open Data Kit or ODK is a phone-based/tablet-based replacement for paper forms. It is a free phone application or tool for surveying purposes. Almost everyone has free access to this application. This gadget allows users to perform their tasks even there is no internet connectivity. The best thing about ODK is that it has clear division among itself in order to carry out survey, from creating the survey and answering the survey questions to analyzing the surveys. This tool can only be applied by Android-based devices. Drag and drop is a pointing device gesture in computer graphical user interface in which the user selects a virtual object by "grabbing" it and dragging it to a different location or onto another virtual object. Although this is such a great feature that should be widely used, drag-and-drop support is not often seen in all software, even though it is a quick and easy-to-learn method. ODK Build builds or creates the form with a drag and drop feature and it does a great job in designing uncomplicated forms. Meanwhile, ODK Collect gathers the data on the mobile and forwards it to the main server. ODK Collect too supports a wide variety of prompts such as text, number, location, multimedia, barcodes, and this information is undoubtedly important for the team in order to have a clear understanding of the addressed concerns. These elements contribute a lot to the survey's evaluation. The most highlighted quality of ODK doesn't only restrict its ability to work under offline condition but also its capability to accumulate the compiled data and display it in a favorable layout.

ODK is freeware, or software that grants free usage to the public domain under licensed provisions. However, the electronic collection of data cannot be accomplished in a timely and organized fashion without a dedicated server instance. To this end, ODK utilizes Google App Engine, a Platform as a Service product of Google, to fulfill the need of a dedicated server. Google App Engine provides "cloud" computing memory services for developers and public consumers to quickly launch web-based applications. Google App Engines utilizes multiple server side coding languages, the four most prominent being Java, Python, PHP and Go runtimes.

ODK directly piggybacks on Google App Engine Server via their downloadable executable program, ODK Aggregate, to produce a ready-to-deploy and collect data server for public and private usage. While the setup of a new server instance to directly interface between the user and the collected data from ODK tools (mainly ODK Collect) requires a base computer, the use of Google App Engine services essentially minimizes the cost of operating and maintaining a server to an Internet-based service. This means that ODK Aggregate servers can be utilized for data collection using free quota-based or subscription based Google Accounts without the hassle of maintaining physical space for hardware needed to run servers, or other related costs.

Our team's main server instance for collecting field data via the Site Readiness survey is hosted by Formhub.org, an ODK derivative service that allows the quick deployment of surveys and quick subsequent collection of data from surveys. Developed by the Modi Research Group from Columbia University, Formhub allows the instantaneous public publishing of surveys on the Internet to a large, account-based user group registered with Formhub. Formhub's beta launch was announced on December 5, 2011. Its most prominent uses were detailed in at least two public blog entries on the Formhub website. One blog published on September 5th, 2011 detailed the usage of Formhub to rapidly collect data points about certain schools that required additional resources in Ghana, and another blog published on October 10th, 2012 detailed the usage of Formhub to survey and plan the rebuilding of energy grids in Liberia within a decade after the 2003 civil war. As of August 27th, 2013, Formhub has logged 1 million form submissions, reinforcing its universality of applications as a data collection service.

Formhub is another data collection tool for mobile phones and tablets. This gadget too enables the users to come up with paper based forms on an Excel spreadsheet and transfer them into mobile or any Android-based devices. This quality allows the users to edit the survey questions easily in Excel in case of any urgent changes needed. Surprisingly, this tool featured the same features as ODK; its key features are data collection, data analysis and data gathering. Formhub does not require any prior technical degree. It can perform its tasks well without data connection too. This tool demands a high learning curve at the initial phase as the users have to build the survey using Excel, but soon after the users understand the whole system; this tool only requires a little more struggle in handling the data collection and analysis.

Both tools are excellent in collecting data for the survey, but considering the difficulties the team might have face in evaluating the data received, ODK or Open Data Kit is the most agreeable tool for the team to be adopted in this project due to its easiness in analyzing the data compared to Formhub which requests a high learning curve.

In this project, the team utilized five different server instances for this survey. There are a total of three Formhub accounts, but the main Formhub account is server instance with identifier ict4diit14. All are listed below:

- **https://formhub.org/ict4diit14**
- **https://ict4dconsulting.appspot.com**
- **https://ict4diit.appspot.com**
- **https://formhub.org/jpvielma**
- **https://formhub.org/iit_ps385s14**

Active previews of both surveys are available, and are accessible without using an Android-powered device with ODK Collect using the Enketo Paper preview engine. The URLs for both surveys are provided below:

SiteAssessment V1.5 Part 1: https://aa2h7.enketo.formhub.org/webform
SiteAssessment V1.5 Part 2: https://k289z.enketo.formhub.org/webform

Positives and Negatives

Undoubtedly, Open Data Kit (ODK) is an excellent tool and it is expected to do a great job in this project from compiling the data to interpreting the data. ODK Collect is a powerful tool, capable of collecting media files, supporting large numbers of questions, and recognizing and implementing group, skip and repeating logic in survey builds, allowing users to rapidly collect multimedia sources of data in a short amount of time in comparison to the use of physical paper-and-pen methods. Although data collected can be saved on the Internet using the “cloud” server instances provided by custom ODK Aggregate servers or Formhub servers, data can be collected and stored offline on Android-powered devices, allowing usage in remote or difficult-to-access locations. Unfortunately, our team encountered a number of design flaws that hindered the construction of a survey build during our initial planning phase. Some of these problems are enumerated below:

- ODK does not automatically refresh the screen when skip logic is used within group of questions on same screen
-It does not display nested groups within groups (i.e. group A in group B, group B on single screen, upload displays error and crashes)
-"Integer" and "decimal" formats for phone numbers cannot expand to have more than 18 digits (limit is 9 for integers, 15 for decimal) when using international phones
-The prompt text for repeating groups is unintuitive for user usage.

ODK Aggregate grants survey developers a scalable server instance that is essentially freeware based on Google App Engine for “cloud” computing, memory and server services. Unlike Formhub.org, servers created by ODK Aggregate’s tools can have limits on access points and actions allowed for registered and anonymous users as defined by administrators and developers of the server. However, a few problems limit the scalability of ODK Aggregate for our team’s purpose:

-clunky interface
-large downloads count as read operations, which in turn --->
-impose large traffic on "cloud" server/storage which leads to ---->
-Daily quota of traffic reached, meaning 24 hours until server can be used again
-requires billing of services if quotas are to be removed (or alleviated)
-not visible on its own, surveys are not publicly visible at first

Although Open Data Kit is highly praised for its distinguished features, its limitation on daily data limit is discouraging since a consistent flow of data collection is ideal for a project of this sort. A data limit to that extent certainly would not satisfy the needs of bigger projects.

On the other hand, Formhub is essentially an ODK Aggregate server which scales according to usage of uploaded surveys, but with a higher potential visibility as opposed to surveys uploaded and stored on custom ODK Aggregate servers. Unfortunately, Formhub does not offer data management to anonymous users not registered with Formhub.org.

Project Challenges

Perhaps the largest challenge faced throughout the project was maintaining a clear line of communication with the survey team in Chuuk. Since the Field Methods team could not travel to the islands to evaluate the schools for technology readiness, the iSolutions team was entrusted with conducting the mobile baseline survey and relaying the information back to the team at IIT. This required a consistent and open line of communication between both teams, which was often not the case. With no direct contact, nearly opposite time zones, and frequent internet connectivity problems, transmitting information and getting the message across proved to be difficult tasks. A shaky line of communication also meant that the Field Methods team was unable to gauge the attitudes and motivation of TR’s iSolutions team as well as any challenges or concerns they may have had. The communication problem also resulted in the frustrating outcome of the wrong schools being surveyed for the first round of data gathering. Main island schools were surveyed, all of which already had internet access and computers, whereas the Field Methods team was more interested in evaluating more remote schools that could experience a greater developmental benefit from a solar computer lab.

Ultimately, the feedback loop could have been much stronger between teams, and a greater level of transparency was needed, especially regarding the expectations and attitudes held by the teams.

Many of the other challenges of the project occurred on the technical end of the spectrum, mainly with the mobile survey form functionality and other ODK and Formhub challenges (as mentioned above). Downloading the pictures from the survey proved to be a challenge during the first round of surveying. In regard to the tablets provide by Inveneo, when the team unpacked the tablets from the boxes, the first bump encountered was that the charger adapters did not fit the wall sockets, since they were 2 pin European adapters. These tablets also only have a front camera, which did not alter the project much, but it would make the survey process smoother and quicker if the tablets actually had the front and back cameras. Other technical issues came about during team communication and data evaluation (see Data Evaluation section).

Even though the team tested the surveys around campus to discover or encounter the problems that might be experienced by the enumerators or survey participants in Chuuk, this testing phase was fairly short lived and the testing sample was small. The testing period provided some good feedback for the initial survey, but it could have been extended and intensified to gather more responses. When the surveys were tested out on campus, a few technical issues were also found which caught the attention of the team. It was at this point that the team recognized that this project would not be as easy as it sounded. It would not be as simple as creating the survey questions, answering the surveys and study the data gathered; there was much more to be accounted for. It is going to be a rocky road to meet the finish line of this project

The time constraint of one semester can also be viewed as a project challenge from the team's point of view. The team fell behind on schedule on a few occasions throughout the semester due to the other challenges, and therefore kept a fairly flexible and open schedule over time. Given more time to work with, much more testing and surveying could have been performed, and more results could have been gathered. There is a lot that went into this project over the course of one semester, but it has great potential to be improved and expanded.

Student Experience

This project presented a new experience for the Field Methods team members. The students collaborated well together and each knew which role they played on the team. The students found it interesting and intriguing to communicate with a team overseas and interact with members of a different culture. Working on a project with real world implications made it more meaningful and stimulating. Though this course had to be balanced with the rigors of an IIT schedule, the Field Methods students participated fully and put in the time and effort to create a successful project. It was a truly good learning experience for everyone involved and may have inspired some members of the team to carry this work forward in the future.

Figure 6: PS 385 "Field Methods" Team

Data Evaluation

To determine which school is most ready and would benefit most from receiving technology, the Field Methods team had to devise a process for evaluating the raw survey data and translating the data into a metric for comparing the schools. The evaluation metric described within the methodology section was used.

The team was able to download the data from the ODK server as it was uploaded by the survey administrators. The raw data was easy to read and was moved on to an Excel spreadsheet

(Appendix B) and then uploaded to a Google Document for online access. At this point, however, the team did encounter two issues with the use of the ODK application:

1. Server capacity

ODK allows free use of their servers, however, it restricts the amount of internet traffic and downloads utilized by applications running on free accounts with quotas. That means only a limited number of files with a specific file size can be downloaded per day. The refresh time is only 24 hours and was only a minor annoyance as the team downloaded the files in .xls format. However, this quota cap may be a problem if the cap is reached only after downloading three or less files, or in the middle of downloading one file. When deciding to use the ODK Aggregate on Google App Engine servers a future team may decide that the free server on ODK is too inconvenient for large scale batch analysis of schools, and utilize an alternate data application/server such as FormHub or Fulcrum.

2. Downloading pictures from the survey

Because of the length of the surveys and the amount of pictures they contained, there was no way to automate the download of pictures from our server instance of ODK without losing track of what each image corresponded to. To accomplish this, each picture was selected from the survey and saved locally to a corresponding folder with an appropriate file name in order to identify to what it pertained. In all, 89 total pictures were received from both surveys, with instances of survey submissions containing as little as 1 and as many as 25 pictures.

The pictures collected from the first round of surveys gave the team some better insight as to what schools look like in Chuuk, and even helped to point out some challenges being faced by the mainland schools. For instance, although some of the schools had access to computers, the pictures indicate that many of the computers were in storage or were not being used. Also, a few of the schools showed pictures which displayed clear acts of vandalism on school grounds (see fig. 7-9).

Figure 7: Picture displaying an act of vandalism/theft at Chuuk High School

Figure 8: What appears to be an unused computer lab at Berea Christian School

Figure 9: Picture from SDA School showing unused computers

After the data has been downloaded from the ODK servers the team was now faced with how to comparatively analyze each data set from the individual schools surveyed. By developing a series of algorithms within excel, we were able to create a numerical definition for each question in the survey (see Appendix C). Starting with a simple point system we were able to assign a multiplier of + or – 10% for key questions answered. This system is intended to be developed along with the survey to allow for more pertinent questions to carry a higher impact in the resultant calculation. By structuring this set of equations at the bottom of the excel document, any user with access to the master formula can easily copy the set over into the latest data downloaded from the ODK server, allowing for easy implementation. The end goal for this process is not to simplify the surveyed schools into a pass/fail criteria, but to develop a "short list" of schools that would benefit the most from the resources at hand.

Outcomes

The team has not allocated a destination for the solar computer lab in a box since the responses currently collected and evaluated represent a very small and inadequate data sample. The iSolutions team was able to get the survey out, but only administered it at six schools on the main islands in Chuuk, all of which already have access to computers and internet. This is not ideal in terms of data evaluation since the Field Methods team would like to place the solar lab at a school that could impact most from its use. A school on a more remote island that is ready for technology but does not have any technology currently would represent a better candidate for the lab. This is not to say that because the "wrong schools" were surveyed that this data is useless. In fact, it is quite the opposite; the survey responses gathered from the field provided the team with a real-life situation to test its work and see if the site survey actually did everything it was supposed to do. For the most part, the survey was effective in gathering the necessary information.

Near the semester's end, the Field Methods team received an email from TR and the iSolutions staff with feedback about the survey and their experience administering it. The feedback was separated into three main points:

1. Both survey parts should be combined into one form

- TR and his team recommended that this be done so that the surveying could flow better since "it takes a minute or two to save and rename the Part1 Survey and Open a New Part2 Survey." Also, because the principals were taking both parts of the survey, it might make sense to combine them into one form.

2. Pictures should be taken at the end of the survey

- This was another suggestion from the iSolutions team, because taking pictures requires time to move and look around, and it would be easier to take all the pictures at the end of the survey when the questions are over and both the participant and surveyor are aware of what they need to take pictures of. The Field Methods team decided to include the picture taking alongside the questions so that the necessary items would not be overlooked, and that the enumerator and participant would take their time assessing each item of the survey, documenting it (if they could) with a picture. The Field Methods team will certainly take this advice into consideration if future iterations of the survey are to be made and tested.

3. The survey questions are straightforward and relevant to the schools

- This is good feedback to hear from Chuuk, and it means that the Field Methods team was successful in developing an understandable an effective site survey. It was noted by TR that it "took a few practice tries to get used to…", but at the end of the day it did what it was supposed to do.

Insights and Recommendations for Future Projects

Over the course of this project, the Field Methods team learned many lessons about the creation and implementation of a baseline technology readiness survey and gained valuable insights that might assist teams working on similar projects in the future. First and foremost, when using mobile technologies to gather information from a distant location, an established and clear line of communication is needed to increase transparency and improve the flow of information between domestic and foreign teams. Being on the same page is crucial to the direction and success of such a project, and that begins with open and consistent communication.

In terms of the technology used, the Field Methods team found some pros and cons with mobile data collection. On the plus side, this method of survey administration is organized and efficient, and can be used effectively over great distances. It is also good for gathering infrastructural data and basic demographic information. However, mobile technology cannot account (at least not entirely) for the human element; that is, the motivations of administrators and teachers, any personal interests at play, the emotion behind an answer, or any other number of factors. Essentially, mobile technology cannot account for the interaction which takes place between the enumerator and the participant, making it that much harder to make decisions based upon the data received.

For the survey itself, taking time to develop the right questions and revise them until a mutual level of understanding is reached is paramount to the success of a site survey. The team also found that the data collected would be more accessible if the open-ended survey questions were limited as it is difficult to “measure” the responses received when the answer is not enumerated as a “Yes” or “No” question. Though open-ended questions can be more descriptive and provide both qualitative and quantitative data, such data is not easily evaluated and must be more carefully analyzed when determining its weight in an evaluation metric. Open-ended questions do have the advantage in collecting more human-related data, such as motivations, detailed accounts/experiences, and even attitudes and emotion depending on the wording of the answer.

Looking forward, the Field Methods team believes that future work should definitely be pursued on this project. Because the team has only worked with Chuuk so far, the factor of universality cannot yet be determined for this survey, so future teams should look into forming relationships with other developing regions and find opportunities to test and improve the baseline survey further. This project has massive potential to be expanded upon and made into something far greater and much wider-reaching. If this course is continued at IIT, it should receive serious consideration to be made into an IPRO course. This way the project would receive more resources, garner more student interest, and gain the support it deserves. Another plan is to turn the project over to the Inveneo team, who certainly have the resources and opportunities to propel it forward and use it to make positive impacts around the world. This baseline survey project could also be merged with other areas of global concern and development, such as climate change, health care, agriculture, or social change. With proper guidance, the right connections, and the right technology, nearly anything can be measured, assessed, and improved.

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Appendix A

ODK Collect and Survey Instructional manual:

ODK Collect Help Page

The following instructions will guide you through the process of properly installing ODK, downloading the forms, filling out the forms and submitting the data.

Steps 1-3 only need to be done once, Steps 4-5 will be done for every person(s) surveyed and Step 6 should be done whenever data connection is available. Survey Part 1 shall be done primarily by an administrator for infrastructure and demographics overview and Survey Part 2 contain general questions for teachers/administrators.

Step 1: Download App (note: this step requires internet connection)

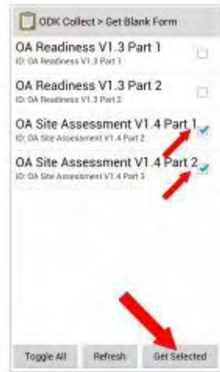
From your Android device, please navigate to the *Google Play Store, s*earch the play store for the *ODK Collect* app and select install. Or get the app from this link: http://tinyurl.com/a79v4rr

Step 2: Connect to Server (note: this step requires internet connection)

Open the app on your Android device and find the "General Settings" page. Depending on your device, this page may be found by clicking the tab on the top right corner of the home page or you may need to press your device's Menu Key. Under "Server Settings" replace the existing URL with the following: https://ict4diit.appspot.com or http://ict4dconsulting.appspot.com. Then please navigate back to the home page.

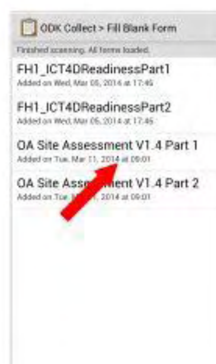
Step 3: Download Survey (note: this step requires internet connection)

In order to have the survey saved on the device it must be downloaded from the server. From the *ODK Collect* home page click on the "Get Blank Form" button. A list of surveys should appear, of which, the following two need to be selected: *OA Site Assessment V1.4 Part 1* & *OA Site Assessment V1.4 Part 2*. After selecting the surveys, click the "Get Selected" button. The app will bring you back to the home page.



Step 4: Access Survey

Now that the survey has been downloaded and saved, it can be accessed at anytime without the need of internet connection. From the home page select "Fill Blank Form". This will bring you to a page with all previously saved forms. From here we select the survey that we will be taking, for example *OA Site Assessment V1.4 Part 1.*

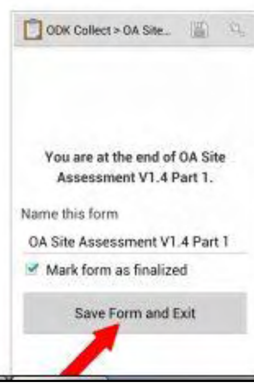


Step 5: Taking Survey

After the survey opens, follow the on-screen instructions through to the end of the exam. Some questions are required to be answered before the exam can be submitted. Please answer the questions as best as possible.

To navigate and view all questions, select the down arrow on the top right corner as shown below. In order for the survey to be saved, you must select the "Save Form and Exit" button at the end of the survey.

In order for the survey to be saved, you must select the "Save Form and Exit" button at the end of the survey.



Step 6: Submit Survey(s) (note: this step requires internet connection)

All surveys that have been completed must be uploaded for analysis. Please select "Send Finalized Form" from the home page. From the prompted page select the check boxes all of the surveys (one or more) that have been completed and need to be uploaded. Then press the "Send Selected" button on the bottom of the page.

The survey(s) is now complete.

Appendix B

Raw survey responses

	A	B	C	D	E	F	G	H	I
1	1.) Please enter in this school's name.*	Chuuk High School	Iras Demo School	Iras Demo School	Iras Demo	Chuuk High School	Berea Christian school	Adventist	Ccpi
2		Tue Mar 25 12:13:34 UTC 2014	Fri Mar 28 05:53:45 UTC 2014	Fri Mar 28 05:00:52 UTC 2014	Fri Mar 28 06:53:57 UTC 2014	Wed Apr 02 03:52:24 UTC 2014	Wed Apr 02 05:58:38 UTC 2014	Wed Apr 02 07:49:44 UTC 2014	Fri Apr 04 05:34:39 UTC 2014
3	2.) Please submit a picture of the school's exterior.	https://ict4diit.appsp blobKey=OA+Site+/ v.1.4- part2%5B%40key% db3d-430e-b930- 0b528bc492cc%5D	https://ict4diit.appsp blobKey=OA+Site+/ v.1.4- part2%5B%40key% a741-43a9-bc20- 5e6ba77473f2%5D		https://ict4diit.appsp blobKey=OA+Site+/ v.1.4- part2%5B%40key% 5f27-48e8-bc7c- 22419f7fdbe3%5D	https://ict4diit.appsp blobKey=OA+Site+/ v.1.4- part2%5B%40key% 8255-4ea6-8bc5- a1d3b1e21b97%5			
4	GPS Location								
5	GPS coordinates (location)								
6	3.) If the device being used for this survey cannot capture GPS coordinates, please describe this school's location uInternet Navigationg the following or a similar format to the following (village, city, province, state, country, continent).	Nantaku, Weno Chuuk.	Iras, Weno Chuuk		Iras Weno Chuuk	Nantaku	Fais , nepukos	N	Nepukos

ROUGH TYPE							TYPE	NAME	LABEL	HINT	REQUIRE
WHAT	DO	ARE	IS	CAN	HOW	other?					
									Demographic Questions		yes
							text	name101	Name of School	The offical name should be provided	yes
							photo	name102	Picture of School	Please include the entrance in the picture.	yes
							geopoint	name103	GPS coordinates (location)		yes
							text	name104	Full name and title of administrator or teacher		yes
							text	name105	Email		
							integer	name106	Phone Number	For contacting the person.	
							select_one teacher_	name107	Select: teacher/administrator		yes
							photo	name108	Optional: Please provide a picture of the person being surveyed		
								name109	Background on school		yes
							select_multiple grad	name110	Which grade levels does this school serve?		yes
		select_					text	name111	Are there any additional comments?	Please provide any information needed to understand the grading system.	
					integer		integer	name112	How many teachers work at this school?	Including teachers assistance and other personal that interact with the children	yes
							select_one yes_no	name113	If yes, are there plaques and signage?		
							photo	name114	If yes, please provide a picture		
					integer		integer	name115	How many students attend this school?	Officially	yes
	select_						select_one yes_no	name116	Does your school keep attendance records?		yes
								name117	Attendance records		yes
							integer	name118	if yes, what percentage attend daily?	Average and best to the knowledge of....	
	select_						select_one yes_no	name119	Does your school keep grade records?		yes
	select_						select_one yes_no	name120	Does your school keep advancement records?	Records about the students.	yes
							integer	name121	if yes, what percentage of students advance to the next grade?	Average and best to the knowledge of....	
	select_						select_one yes_no	name122	Does your school keep graduation rate records?		yes
							integer	name123	if yes, what percentage of students graduate to further education?	Avarage and best to the knowledge of....	
					integer		integer	name124	How many months out of the year is school in session? (Academic Calendar)		yes
								name125	Site Conditions		yes
								name126	Building Condition		yes
							text	name127	How old is the current school building?	best to the knowledge of....	yes
text							text	name128	What is the material and status of the current school flooring / foundation?	best to the knowledge of....	yes
							photo	name129	Please provide a picture of the foundation	If possible	
text							text	name130	What is the material and status of the current school walls and windows?	best to the knowledge of....	yes
							photo	name131	Please provide a picture of the walls and windows		
text							text	name132	What is the material and status of the current school roof?	best to the knowledge of....	yes
							photo	name133	Please provide a picture of the roof		
					integer		integer	name134	How many levels does the building have?	Including sub levels and the basement (if exists).	yes
					integer		integer	name135	How many rooms are in the school?	class room size	yes
							text	name136	Describe the lighting situation	*	yes
								name137	(*prompt for pictures)		
			select_				select_one yes_no	name138	Is the building secure from severe weather?	best to the knowledge of....	yes
							text	name139	If no, please elaborate	Please inclide information on weather demage from past years.	
							photo	name140	(*prompt for pictures)		yes
			select_				select_one yes_no	name141	Is flooding an issue?	best to the knowledge of....	yes
							text	name142	If yes how often does the school flood?	Please provide experiance from past years.	
		select_					select_one yes_no	name143	Are there alternative uses for this building, other than school functions?		yes
							text	name144	If so, what are the alternative uses? (Open-ended question)	What are the uses and when is the building used.	
			select_				select_one yes_no	name145	Is property damage / vandalism / theft a problem at the school?	Please provide experiance from past years.	yes
							text	name146	If yes, elaborate? (Open-ended question)		
			select_				select_one yes_no	name147	Is there a secure location to store technology?		yes
							text	name148	Please describe this location. (Open-ended question)	Please provide information about the electircal options, security of the location and the ease of use for groups.	
							photo	name149	(*prompt for pictures)		
								name150	Infrastructure		yes
			select_				select_one yes_no	name151	Is there electric power available on site?		yes
							select_one power	name152	If yes, how is it supplied? (Generator / Solar / Wind / Grid / Other?)		yes
								name153	Generator:		
							text	name154	How often is the generator used?	Please describe past usages and past years expiriance with the system.	
							text	name155	Who pays for the fuel?	Please elaborate on the funding options if possible.	
							photo	name156	(*prompt for pictures)		
								name157	Solar:		
							select_one gr	name158	Where is the system? (Ground or Roof)		yes
					integer		integer	name159	How many panels are in the system?	best to the knowledge of....	
							photo	name160	Please provide pictures of the panels		
							photo	name161	Please provide pictures of the batteries, inverter, and any other system parts		
								name162	Wind:		
					integer		integer	name163	How many wind turbines are there	best to the knowledge of....	yes
							photo	name164	(*prompt for pictures)		
								name165	Other:		
							text	name166	please explain	Please describe past usages and past years expiriance with the system.	yes
							photo	name167	(*prompt for pictures)		
							select_one yni	name168	If yes, is electricity reliable? (Voltage spikes, blackouts, etc.?)	best to the knowledge of....	yes
							select_one yni	name169	If yes, is electricity available all year?	best to the knowledge of....	yes
							text	name170	if no, when is it available? (Typed response)		
							text	name171	If yes, who installed the system? (Typed response)		
							text	name172	If yes, who maintains the system? (Typed response)		
			select_				select_one yes_no	name173	Is there cell phone coverage on site?		yes
			select_				select_one yes_no	name174	Is there access to internet?		yes
							text	name175	If yes, Who provides it?		
							text	name176	If yes, How is it paid for?		
							text	name177	If yes, How reliable is it?		
							text	name178	If yes, do you know the internet speed?		
							text	name179	Please add any additionals comments or details about your internet connection		
text							text	name180	What is the commonly used means of communication outside of the school, for example, to the Dept. of Education? Radio/Cellphone?		yes
			select_				select_one yes_no	name181	Is there running water on site?		yes
							select_one yes_no	name182	If yes, do you drink the water?		
		select_					select_one yes_no	name183	Are there toilets/latrines on site?		yes
							select_one in_out	name184	If yes, are they inside the building or outside?		
							photo	name185	(*prompt for pictures)		
		select_					select_one yes_no	name186	Are there roads to the school?		yes
							photo	name187	(*prompt for pictures)		
		select_					select_one yes_no	name188	Are there trees around the building? (*Is the site viable for solar)		yes

Appendix C

Data evaluation diagram:

School		Test School_01	Test School_02	Test School_03	Test School_04	Test School_05
Grades Served	_Indicator_	1	9	5	5	14
Grade Multiplier	25 point per grade	25	225	125	125	350
Number of Students	1 point per student	235	431	80	1200	177
Number of teachers	10 points per teacher	2220	200	90	500	160
Signage Multiplier	x1.1 / 1.0	1.1	1.1	1.0	1.0	1.0
Attendance Records Multiplier	x1.1 / 1.0	1.1	1.1	1.1	1.1	1.1
Grade Records Multiplier	x1.1 / 1.0	1.0	1.1	1.1	1.1	1.1
Advancement Records	x1.1 / 1.0	1.0	1.0	1.0	1.0	1.0
Graduation Records Advancement	x1.1 / 1.0	1.0	1.1	1.1	1.1	1.1
Academic calender Multiplier	10 points per month	0	90	100	90	100
Building Age	-1 point per year	0	-40	-30	-51	-34
School rooms	1 point per room	0	18	0	38	20
Sever Weather	x0.9 / 1.0	0.9	1.1	0.9	1.1	1.1
Flooding	If yes -50 points	1.0	-50	-50	-50	-50
Multi Use	x1.1 / 1.0	1.0	1.1	1.0	1.1	1.1
Property Damage / vandilism	x0.9 / 1.0	1.0	1.0	1.0	0.9	0.9
Secure Location	x1.1 / 1.0	1.0	1.1	1.1	1.1	1.1
Power	x1.1 / 1.0	1.0	1.1	1.1	1.1	1.1
Reliable	x1.1 / 1.0	1.0	1.1	1.1	1.1	1.1
All year	x1.1 / 1.0	1.0	1.1	1.1	1.1	1.1
Cell phone range	x1.1 / 1.0	1.0	1.1	1.1	1.1	1.1
Internet Access	x1.1 / 1.0	1.0	1.1	1.1	1.1	1.1
Running Water	x1.1 / 1.0	1.0	1.1	1.1	1.1	1.1
Potable Water	x1.1 / 1.0	1.0	1.0	1.0	1.0	1.1
Toilets	x1.1 / 1.0	1.1	1.1	1.1	1.1	1.1
Roads	x1.1 / 1.0	1.0	1.1	1.1	1.1	1.1
Subtotal -01	Sum_01	2480	856	295	1825	687
Subtotal -02	Multiplier _01	1.21	1.4641	1.331	1.331	1.331
Subtotal -03	Sum_02	1	18	20	27	36
Subtotal -04	Multiplier _03	0.99	2.59374246	2.357947691	2.334368214	2.567805035
Subtotal	Sum -	2481	874	315	1852	723
Subtotal	Multipler -	1.1979	3.797498336	3.138428377	3.107044093	3.417748502
School	Name	**Test School_01**	**Test School_02**	**Test School_03**	**Test School_04**	**Test School_05**
Interviewee	Person	**Teacher_A**	**Teacher_B**	**Principal_A**	**Principal_B**	**Principal_C**
Initial Score		**2971.9899**	**3319.013546**	**988.6049387**	**5754.24566**	**2471.032167**