Team Organiz-Nation

Final Proposal

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Problem Statement – How might we (40%)

(Problem- please address who, what, when, where, and why)

Team Organiz-Nation's how might we is "How might we fix the lack of information exchange surrounding water purification maintenance by establishing a communication pathway between Malawi's Ministry, the maintenance workers, and the organizations working in the country?". In Malawi's government there is a disconnect between the local communities and NGOs. Therefore, our problem space is to focus on building a system for the communication and data upkeep and to ensure sustainability of these databases. We have chosen Malawi due to its small size and a contact we have who works for Malawi's Ministry and can provide firsthand information for our team. This has been an ongoing problem despite the country's attempts to improve its infrastructure, health, and educational systems.

(Significance why is this problem important- need 2 cited references for each!)

(A – What are the costs to society without fixing the problem)

The costs to society by not fixing the problem ranges from time to resources. Currently, Malawi lacks funding for water sanitation and maintenance. The available funding is at a mere 95,228 USD for the Health sector as a whole. Of this, only 7% is allocated specifically for Irrigation and Water development. Although there is funding available, this money is largely being wasted due to a lack of communication between the government and various NGOs that are implementing these structures and programs. This directly leads to upkeep of wells and water pipes. Also, a pipe may need either repairs or parts to repair it. However, if the government is not informed by the NGOs of these requirements, the systems may be irreparably damaged before repairs can be made. Also, without proper data on the parts of these systems, the government may be spending unnecessary money on incorrect parts. Also, there is often a "brain drain" effect in communities because as pipes are being repaired less and less, knowledge to repair these facilities is lost over time. Also, workers may move away without notice, may forget their training without use, or new workers are simply not being trained. Jobs like these stimulate the economy, and with their loss, they detract from the forward push that Malawi is trying to make. This problem also majorly affects society's health, as lack of working pipes and pumps directly and significantly impacts the communities. These communities and villages will have little, or even potentially no clean water to bathe, cook and drink with, detracting from the basic human needs to survive.

(B- What are the possible causes of the problem)

The causes of the problem are mostly at a governmental level. According to Millennium Developmental Goals, Malawi's water sector is headed in the right direction. However, core issues constraining their processes include "Historic weak sectoral leadership and coordination". This is highlighting how there is poor advocacy of water issues at a national level along with poor coordination among sector agencies, especially NGOs. This directly leads to poor quality information by the decision makers in the country. There is an inconsistency surrounding the data upkeep due to information being unreliably and infrequently given to the sectors that require it. Not only is there a lack of communication in the governmental sectors, there is a poor communication infrastructure between NGOs, communities, and the municipality. They often do not provide each other with the information necessary which furthers the "weak sectoral coordination". For example, if a pump breaks in a community, the local leaders may not inform their sector official because they don't want to pay for it or have other issues to worry about. Thus, the pump is not repaired in time and the pump's damage may continue to grow to be irreparable.

Also, many NGOs have projects in Malawi, but they may be failing to thoroughly inform Malawi's water and infrastructure sectors on the details of these projects, the necessary maintenance, projected costs and so on. Also, there are multiple NGOs implementing similar projects in a widespread of areas however, they do not inform Malawi's Ministry limits or establish a concise localization of project data and details. On top of there simply unreliable communication pathways between the government and maintenance workers. Although there is a National Data Archive, a storage house where mostly raw data from various surveys is documented, it is based over an online catalog. This service is useful in theory, but not all offices have internet or even electricity. Despite this forum's existence, not everyone can access the updated information regularly. This has led to infrequent surveys being logged or even administered.

(c How would society be improved if this problem were better addressed)

By creating an improved and efficient communication pathway and data storage method, society in Malawi will most certainly improve. This pathway will ensure that facilities would be up kept and properly maintained. Without these water purification units, villagers would be required to spend time traveling to other water sources, instead of having water piped to their homes. Due to this immediate access to water, the rates of children in education have increased, and women are able to spend more time farming or other completing other necessary activities. With our projects help the economy can be further stimulated by creating an office that deals with data and correspondences that requires civil servants. This would be in addition to those needed for maintenance and repairs for the water infrastructure. A communication pathway would include a place for data storage, which would allow the government to retrieve information about NGOs, water systems and necessary needs and maintenance. NGOs

will also be listed in a central location, which will prevent their and donor's money from being wasted on a system that is not well maintained. The government could remain in contact with local municipalities and government sectors, and thus more aware of the projects other NGO are implementing. This will significantly increase their efficiency.

(Stakeholders- who does/doesn't think this problem is important/ who is impacted. 4 stakeholder perspectives)

Those that directly work with the water sector, especially NGOs and government officials find the problem important. This is because they are directly impacted by all aspects including financial, technological and economical. Individuals that live in communities, especially those in remote villages, are directly impacted by this problem. Not all, however, most find the organization of data important. Maslow's Hierarchy is a psychology theory that states that until base needs are fulfilled, higher levels of organization and needs are not necessary. This basis of needs includes food, water safety and shelter. Thus, some individuals cannot picture the effectiveness of a new system of implementation until all of the base needs are met. However, contrary to these beliefs, a higher level of organization actually directly leads to the access of water for the communities. With improved communication of the communities' base needs, these villages can grow and expand their capabilities to improve their lifestyles.

Furthermore, stakeholders in the problem include villagers, members of Malawi's Ministry in the water sector, community leaders in a small towns, and project managers of a water and irrigation oriented projects. A villager pays 30% of their yearly income in taxes, which is then imposed on different sources such as labor, pensions, and dividends. Along with money the government borrows from the world bank, their taxes are put towards infrastructure, water and sanitation. Thus, besides resources such as water and sanitation, as basic human right, the villager invests in such resources regardless. They expect a level of resources provided to them. The villager would be willing to continue to pay their taxes especially if their health and sanitation sector significantly grows simply from better levels of data transference and communication at the governmental level. The member of Malawi's government is at a level where they hold decision making abilities, especially those revolving around managing organizations, delegating tasks and distributing money. This member is receiving money from villagers, as well as loans from the world bank. Despite a source of funding, their actual provided funds are very low, which warrants caution by the Ministry member. This member is trying to improve their country and manage affairs. However, if implementing a communication pathway and platform for data transfer streamlines work and prevents unnecessary waste, they would be very likely to provide effort and resources to ensure system is implemented. The community leader must balance the affairs of their community, as well coordinating with the government. This level of organization will provide them with a streamlined method of information and data

transfer. It will also provide a direct communication line with various NGOs that are trying to implement projects in their areas of jurisdictions. The NGO coordinator may feel they have the smallest stake in the results of a communication and data storage program. They may think that they are not directly being benefitted, whether by financial means, investments, etc. This NGO will realize that this Grand Challenges program can benefit them in more significant ways than they expect. For example, if they are aware of the various projects that other NGOs are implementing, they will be able to make more informed decisions on what needs to be accomplished. They will also be able to provide the government with a consistent list of resources necessary to succeed, including funding, parts, labor and so on.

(Context and existing solutions- collect and analyze background info that pertains to the problem.)

In Malawi, most rural communities get their water from a local water source through boreholes, gravity pipes or a hand pumps. These water sources can feed individual homes or public pumps. Our project focuses on the organization and data collection for these pumps to help the government be more aware about when these water systems are working. Our solution will help direct funding where it is needed. The basic idea for this project came from wanting to address the problems that surround water sanitation. We chose communication and to increase the information exchange between the government and the NGOs working there. Two projects that contain similar goals are Charity Water and International Development. These projects, however, have do not fully solve the problem at hand to directly involved the government of the country and they address quite broad areas. Charity water is an organization with the focus on describing every project implemented, accrediting the partner, and raising money to fund various projects around the world. This includes Malawi where they partnered primarily with Pump Aid to implement wells. Although this organization is successful in implementing wells, there are many issues with pump upkeep and communication with their partners and other organizations in the area. Their map is well designed because it is user friendly and the descriptions are well detailed. International Development is an organization founded by Susan Davis, a Grand Challenges Advisory board member, and is designed to describe the key elements needed for a successful water project. Davis's site provides tips and examples of successful water projects as well as failure statistics. This database is successful because, while it has a different goal than our project, it provides excellent information for people who are starting water sanitation projects. While both projects are user friendly and informative, they are not as specific as ours will be and do not show a deeper connection with a country's government in order to make a change. Ours database will aim to be as informative as theirs however, specifically useful for the government and groups in Malawi.

Why is it still a problem?

This is still a problem in Malawi mainly due to Maslow's Hierarchy of Needs. Malawi is a developing country where most of the population struggles to get food, shelter and clean water. The government is usually on survival mode and has to put its primary attention on providing necessities to its citizens. Due to this impediment, there is a lack of innovation and advances in technological development for the country. Not everyone has access to computers or internet. While most people have small cellphones it is very expensive to make calls. Another issue, relating directly to the affairs of the Ministry, is the cycle of brain drain in communities. This is the cycle of people being trained to maintain the pipes however they die, leave or forget how to fix it and cannot do their assigned duty.

Proposed Work (40%)

Goal

The goal of our project is to create and implement a sustainable method of communication and data storage to unify Malawi's ministry and various NGOs. The scope of our problem is currently to work in the field of water and irrigation, and with our success we will create a significantly more efficient information pathway that ensures resources can be maintained and delegated in the most efficient manner. This is possible because efforts of the NGOs will not be unnecessarily duplicated, and their resources will be used effectively. A communication pathway will between the ministry and NGO body will aid in this, as well prevent their already implemented projects from falling into disrepair though consistent updates.

Objectives

In order to achieve efficient distribution of clean water to the people of Malawi, we must assess the condition of the existing water infrastructure and start creating a database with this information. The creation of a database of existing wells, water infrastructure, and employees is the catalyst for ensuring access to clean water for the people of Malawi. The database will provide a convenient and easily accessible way for the government and the villages to track the efficiency of their water systems and see when these systems are no longer working. For the initial stages of our project, we will need to obtain funding from existing NGOs, such as the Bill and Melinda Gates Foundation, or from the government.

Once funding is under control, the next step is to establish an effective line of communication for weekly updates on all the pumps, lines, and trained personnel in Malawi. Because of the scarcity of internet in these communities, we plan on sending printed maintenance and repair instructions to all of the pumping stations. These manuals will be found in both English, the national language, and Chichewa and will be laminated to ensure their longevity. The instructions will be extremely detailed and will tell the worker(s) exact areas to check for certain types of problems and solutions for

repairment. If the problem is more complex than one printed in the manual, the worker(s) will be advised to notify the database, so the government can allocate funds for repairment. In order to ensure that the pipes are being properly maintained, our group will incentivize the workers by providing adequate compensation, such as a certain amount of free data per some amount of time worked.

Furthermore, we would design and prepare for the installation of water flowmeters that would report weekly water usage via satellite communication. These weekly water usage reports would then enable us to know if the systems are working properly. In addition to the flowmeters, pH and other water quality tests will be conducted and recorded for government and WHO approval.

Questions we will have to ask and find answers to in order to advance our project and ensure success include: Who are the manufacturers of the parts, are they the sole providers? Where are they located? What were the contracts, if there were any, with these companies? If not, can parts be imported from another company more cheaply? If no contracts were made, than the Malawi ministry can use bargaining power to obtain parts for the filters and handpumps more cheapily than before.

In addition to flow meters, our group is thinking of taking an alternative route which will use sensors instead of individuals sending information to the database. The sensors would be solar powered and would run continually using rechargeable solar batteries during the night. The head of the village would be in charge of this system.

Another idea would be to have a video-training, online course that can be downloaded by the villagers. Once they have watched all of the training videos, they will be able to take a test and obtain a certification that will allow them to be acknowledged as an authorized technician. To combat the lack of access to internet, these videos will be easily downloadable and the tests will be administered once the person feels they are ready to take it. The usage of these videos will allow for knowledge and skills to be gained quickly and efficiently, so that we can combat the brain drain and aging that have disrupted the repairment of these systems in the past.

Success of this project will be measured by the weekly water distribution data obtained via satellite from each pump, if distribution and efficiency of the pipes increase over the months and years, communication was the issue that needed to be addressed and there was a need for us, Organiz-nation. Two main anticipated problems are obtaining funding to support our project, and designing the satellite water flowmeters that are robust enough for the environment and adequately convey the information that is required.

Project Team

For this project to be functional we will need a minimum of four team members whose jobs range from creating and managing the online/offline database, analyzing data and financial concerns, commuting with the ministry and local maintenance

workers, and developing a technical information platform for maintenance workers and employee training. Although there is likely room for additional positions, these positions are not apparent at this time. As the project progress and we receive more information from Kristina Nilsson, leader in Malawi's Ministry of Water, additional tasks will be allocated. The online/offline database developer's primary task will be designing the website and communicating with other team members to effectively represent the information they are discovering. The website designer will be formatting the user interface, from the homescreen to the drop downs, and overall presentation of information. They will be communicating with the financial/data collector to make sure all numerical information regarding funding and allocation of resources is properly documented and represented. The website designer will gather information from the government and community contact specialist to put onto the database. Lastly the web designer will put the information gathered by the technical specialist to effectively communicate the information for current and future employees of the water sector in Malawi. One of the major challenges will be creating an interface that is easily navigated, as some people accessing the information have little exposure to technology.

The financial and data analyzer will have two tasks, organizing information about current pumps, wells, and other systems already running, and deciding how to effectively allocate funds and resources. There is currently no information about the locations of all the systems in place around Malawi, thus collecting this information is very important. In addition organizing the information will help determine how the ministry can best allocate funds when needed (it is important to realize that team Organiz-Nation will be consulting with Malawi's Ministry of Water, not dealing with the direct movement of capital). This team member will also be in charge of looking for grants and funding options, in addition to analyzing the funds available through the ministry.

The communication specialist is going to be the group member who communicates with the Ministry,federal and local governments representatives, and NGO's that are currently Malawi that are working in the water sanitation sector. This team member will need to have extensive knowledge about the allocation of government funding and resources. In addition, this team member is going to seek contact information for local workers and NGO's that can assist in the development of a stronger communication infrastructure. This last point is essential to the last team member.

The last team member will be the technical advisor tasked with developing a centralized network about the information necessary for maintenance and training. One of the current failures in the system is that when employees leave, their replacement do not know how to fix the systems. In addition, many of the training systems in place are not effective in developing useful

employees. The task of the technical advisor is to gather as much information possible to create documents that can assist in the education and maintenance process.

After discussing our future plans without current advisor Courtney Di Vittorio, we acknowledge that she was a key part of getting this project started. We hope that her knowledge in the water sector as well as her previous experiences with Engineers Without Borders will help guide us along our journey to making in impact on the Water infrastructure in Malawi.

Timeline

Summer 2016 -

- Evaluate the work we did this semester and conduct research to fill the wholes in our project.
- Pitch our final solution idea to Kristina (our contact in Malawi).
- Research simple, low power communication tools and sensors.
- Get in contact with the main NGOs that build the water pumps to learn about the materials use and what goes on on their end

Fall 2016 -

- Build a partnership with an NGO or service in Malawi who could benefit from our product
- Finalize our business plan

- Gather new contacts in the Malawi Government or get in contact with a local leader
- Have a website or basin for our database

Spring 2017 -
- Obtain a functioning prototype to be able to show Malawi's government
- Possibly recruit an Electrical Engineer
- Keep in touch with our contacts
- Get data of Malawi's current situation and upload to database

Summer 2017 -
- Test and perfect the technology and online-offline database system

Fall 2017 -
- Continue to test and perfect the technology and online-offline database system
- (If a successful product is ready) Send product to Kristina or a local organization in Malawi

Spring 2018 -
- Replicate the perfected product
- Give to Malawi
- Find a new target population or hand over product to an NGO that can expand it to another country in need

Budget

We understand that flights to Malawi are very expensive; most tickets now are over 2000 U.S. Dollars (USD). However, if our team, or two representatives of our team, could be financially supported to travel to Malawi that would be the key element to solidify our understanding of Malawi. Besides travel, we will need supplies, such as sensors, wires or cheap telephones to work on our product. We estimate the costs of these supplies will be under 200 USD. The sensors we would need to experiment with are more costly and would hold a budget of up to 300 USD for all the motherboard and sensors. In terms of services, it would be beneficial for us to be able to hire a consultant that lives in Malawi, such as our contact Kristina. The consultant would be able to collect data, speak with the government and give us the information we need to fill the holes of our research. The cost of this service would be negotiated later on depending on the amount of work we would need done. In total, without travel, we would require a budget of $500 for prototyping and several hundred more for the consulting service.

Expected Outcomes and Future Directions (10%)

This is a difficult area to tackle because, not only are we dealing with innovating existing communication technologies but, we are working with the organization of a government. We believe this is feasible because Malawi needs this communication pathway to fix their water distribution and pump maintenance. When this project is over we hope to have improved the communication pathway in Malawi between the maintenance workers and the government. The water pumps will be able to be fixed immediately and water will be constantly supplied. If this communication problem is fixed, the Ministry of water will be able to focus on improving the sanitation or distribution of water instead of worrying about the pumps working.

After two years, the product will be functioning or close to functioning and can be handed over or sold to an NGO, or given to the Ministry in Malawi. For this to happen we need to have built the device/database and have data to get it started. We also need to train people in Malawi to use it and make sure there are people to fix the pumps. The collaborative relationships we need are our connection to Kristina (a worker or Malawi's Ministry), a relationship with a local leader in Malawi, a partnership with an NGO that works in Malawi or with the manufacturers of the pumps to know how they can be fixed. These relationships will help us learn about and thrive in this problem space. We will eventually need help with the electronic component and will need to develop the communication skills necessary for interacting with government officials.

Sources

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