

UNIVERSITY OF TORONTO
ESC201: ENGINEERING SCIENCE PRAXIS III

BUCKMINSTER FULLER CHALLENGE
FINAL DESIGN REPORT

THE GOOD SAMARITAN PROJECT: ADDRESSING THE ISSUE OF THE GLOBAL BYSTANDER EFFECT

Keywords: bystander effect, millennium development goals, trimtab, empathy, Web 2.0, open-access media

December 7, 2007

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MISSION STATEMENT

The Buckminster Fuller Institute issued a challenge to the world, requesting entries in a bid to find a solution to some of the world's most pressing problems. In the course of this design project, titled *The Good Samaritan Project*, we will identify a unique source for many of humanity's most pressing problems, namely the *Global Bystander Effect*. Drawing from existing initiatives and designs, this project will aim to justify a solution to this problem by applying design science principles.

The solution, named *Pangaea Ultima*, will aim to solve the global bystander effect by bringing open-access media to the developing world, where many of humanity's most pressing problems remain unsolved. By empowering the underprivileged in developing nations to share their story with the world in a free and open manner, people all around the globe will be able to identify with their counterparts in developing nations. The awareness that this project raises will be different from pre-existing solutions, since for the first time, people in developed nations will be able to see developing nations as they truly are, without having to physically travel there.

DEFINING OUR PROBLEM



IDENTIFYING HUMANITY'S MOST PRESSING PROBLEMS

Today, billions of people live in underdeveloped countries, where progress is plagued by disease, hunger, thirst, poverty, warfare, and corruption. Despite the many attempts by charities and other humanitarian organizations to aid these societies by bringing them technology and resources, these nations are still struggling to deal with the multitude of problems they face.

Just a few concerned citizens run humanitarian organizations in developed nations; in order to deal with the mounting

← FIGURE 1 - THE 8 MILLENNIUM GOALS AS IDENTIFIED BY THE UNITED NATIONS; THESE REPRESENT HUMANITY'S MOST PRESSING PROBLEMS (5).

problems of today's societies, a far greater effort must be given – not only by those in charge, but by all citizens of the developed world.

The United Nations proposed a set of eight *Millennium Development Goals* (figure 1), designed to tackle humanity's most pressing problems and bring human civilization into the new millennium. Of the goals in the list, many of them – such as universal primary education, reducing child mortality, and eradicating hunger – have already been solved, or are under control in the first world.

Although the goals are slowly being met, many of the developing countries are still stuck in a vicious cycle, since the amount of aid they receive from developed nations (1) is just 1% of their Gross National Income (2). This amount is not even enough to cover the interest payments on the debt owed to the developed nations (3).

According to the CIA World Factbook (4), death rates and child mortality rates are most prevalent in developing countries. Most notably, in Africa, child mortality rates are as high as 10%. HIV/AIDS is present in as much as 38.8% of the population in Swaziland, and the figure is close to that in many similar developing countries. The unemployment rate in some African countries is as high as 80%, leading subsequently to poverty and hunger. A 2007 UN report indicated the need for a strong focus on addressing the needs of developing nations (5). Despite the fact that humanity has already addressed the majority of these problems in the developed world, they persist in developing countries.

The core of these problems lies in the fact that they are socio-economic issues, not easily tackled by science and engineering solutions directly. While organizations such as Engineers Without Borders attempts to aid underprivileged people through physical solutions, many of the underlying problems are left untouched.

Developed societies have the responsibility to aid their fellow humans; they have the resources, the wealth, and the ability to do so. Unfortunately, the individuals in developed nations are so preoccupied with their own lives that they do not even stop to think about the plight of billions of people on another continent.

Year	1992	2002
Aid (\$US, billions)	65	49
Debt (\$US, billions)	1667	2572
Interest (\$US, billions)	83	129

TABLE 1- AID RECEIVED, DEBT, AND INTEREST PAID BY DEVELOPING NATIONS (3).

When only a select few in humanitarian aid organizations are doing what is necessary to help solve problems, many members of society feel indifferent to the cause, and choose to ignore them in the hopes that others will deal with the situation.

THE GLOBAL BYSTANDER EFFECT: A TRIMTAB FOR THE WORLD'S GREATEST PROBLEMS

What is it about human nature that allows this shocking phenomenon to occur? Research by Princeton Psychology's John Darley (Ph.D.) reveals something called the Bystander Effect, whereby people in groups tend to ignore problems, sometimes even emergencies, which do not directly affect them (6). Postulated theories on the cause of this effect include the diffusion of responsibility, unwillingness to get involved in others' problems, lack of awareness, the fear for one's safety, and a lack of empathy for the victim(s).

The bystander effect is a prevalent factor in human rights abuses and social indifference to third world problems. The bystander effect can be used to describe not only the ignorance of problems of another individual, such as passing by an injured or homeless person, but can also be used to describe a general social ignorance of problems from other countries (7); this is what we refer to as the global bystander effect.

Figure 2 depicts a pyramid of problems facing society, starting with those identified by the United Nations at the top. In order to solve these tremendous problems, the problems located below it must first be addressed. Located at the tip of the pyramid, the cause of many continual problems, is the global bystander effect. This problem is one that has become inherent in all societies around the world. It is imperative, therefore, that a solution to the problem of the global bystander effect must first be produced if there is to be any hope of addressing the millennium goals identified by the UN (5).

Rather than rushing and frantically trying to tackle the world's most pressing problems directly, a more sensible approach must be taken by first solving the smaller, underlying problems one at a time. It is this philosophy that defines the global bystander effect as a trimtab; a problem, that when corrected, will create an initial momentum to allow greater problems to be solved with far less effort and resources.

A GRAPHICAL APPROACH TO DEFINING A TRIMTAB:
THE INVERSE PYRAMID

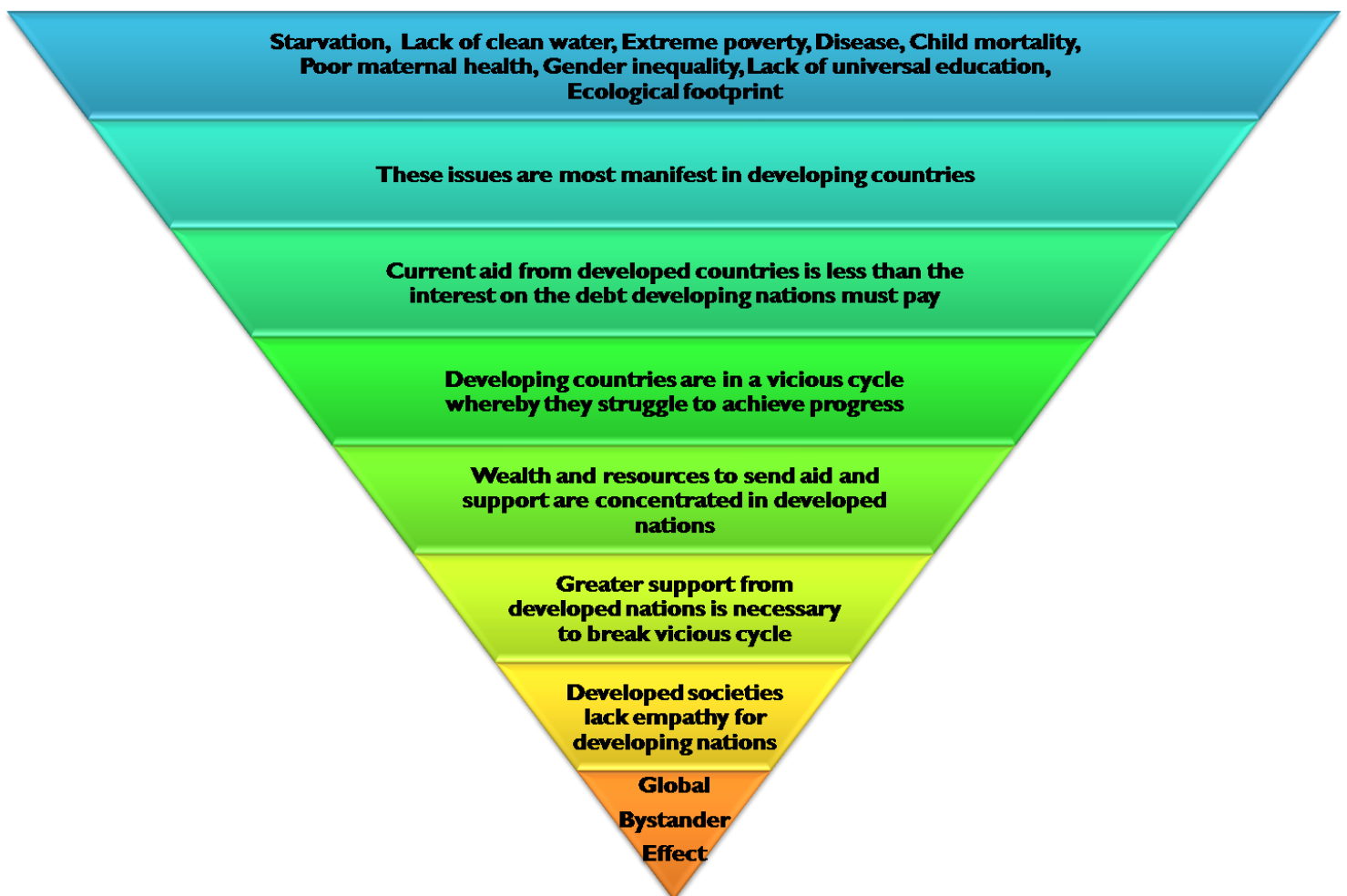


FIGURE 2 - THIS DIAGRAM IS AN INVERTED PYRAMID THAT DISPLAYS HUMANITY'S MOST PRESSING PROBLEMS (FIGURE 1), AS DEFINED BY THE UNITED NATIONS (5), AT THE TOP (BASE), AND THE GLOBAL BYSTANDER EFFECT, THE TRIMTAB FOR ALL PROBLEMS ABOVE, AT THE BOTTOM (TIP). INTERMEDIATE LEVELS ILLUSTRATE THE LINK BETWEEN THE TRIMTAB AND THE RUDDER; IN ORDER TO POSITION THE RUDDER, THE TRIMTAB MUST FIRST BE PIVOTED.

PANGAEA ULTIMA: OUR PROPOSED SOLUTION

WHY PANGAEA ULTIMA?



FIGURE 3 - A RENDERING OF WHAT EARTH WILL LOOK LIKE 250 MILLION YEARS FROM NOW. THE SINGLE LAND MASS DEPICTED IN THIS PICTURE IS REFERRED TO AS PANGAEA ULTIMA (17).

Pangaea Ultima, the chosen name for our project, is a geological term for the reunion of continents into a single land mass in approximately 250 million years from now. The name of our project serves as a metaphor for reuniting the Earth's peoples, however, in a time span much shorter than that for the real *Pangaea Ultima* to occur.

FRAMING OUR SOLUTION

A solution to the global bystander effect in both developed and undeveloped nations will bring forth a society of people that are not only aware of the social and economic imbalance between developed and developing nations, but will actively push for change. They will learn to appreciate the standard of living as a fortunate privilege and reach out to ensure that their counterparts in developing worlds can attain the same.

Research on the subject of bystander intervention has shown that the bystander effect is heavily related to an individual's identification with the group being ignored. That is, a person is more likely to help another individual or a group of people if they can identify with them – without relation to relative geographical location (7). Citizens of the developed world may live far away from

those in the third world, but as long as they can relate to those in the developing nations, aid can and will be given.

To combat the bystander effect, one must be able to form compassionate, emotional bonds between different people. If a person can see from the point of view of one in need, then they will be far more likely to help.

EXISTING INITIATIVES

While a solution to the global bystander effect has not yet been fully proposed, there exist a number of existing initiatives which help solve similar problems around the world. These solutions were analyzed in an effort to understand their strengths and weaknesses in regards to solving the global bystander effect.

James Nachtwey, an influential photojournalist and winner of the 2007 TED Prize, is an example of someone working in this direction. Nachtwey has dedicated his life to taking photographs in war zones and impoverished nations (8). His personal efforts in documenting wars,

epidemics, and important issues in both the developing and developed world have helped many people better identify with those who are in need of aid.

Free the Children, an organization dedicated to aiding children in the third world, focuses on the concept of conveying a global sense of belonging and to help people find self fulfillment in aiding others. Craig and Marc Kielburger, the founders of Free the Children, believe that by spreading compassion, and reaching out to touch the lives of others, the world will become a better place (9). To this end, Free the Children holds youth conferences on an annual basis to bring children together and to tell them how they can make a difference.

Finally, the Pangea Day initiative by acclaimed documentary filmmaker and 2006 TED Prize winner Jehane Noujaim aims to bring together people of different ethnicities in different nations using film (10). Pangea Day is a live broadcast across the world in various nations, airing films produced by people in different countries. Noujaim hopes that she can use the media to enable compassion and understanding between people of different cultures.

Establishing identity with developing nations as well as instilling compassion are central to combating the bystander effect. Efforts from the likes of James Nachtwey, Free the Children and Jehane Noujaim embody this ideal – however, there is still great room for improvement.

CRITERIA FOR A SOLUTION

Before fully developing a solution to the bystander effect, one must consider some criteria with which to judge the design. A “trimtab” solution must be cost effective, scalable, easy to implement, and verifiable. It will satisfy the needs of the problem, and at the same time address the entry criteria of the Buckminster Fuller Challenge.

Using the criteria, the strengths and weaknesses of the existing initiatives can be evaluated. It will then serve as a guide to developing a solution to the global bystander effect using design science and engineering design principles.

- **Cost Effective:** Due to the nature of dealing with developing nations, who are often pressed for finances, cost is of utmost importance. A good solution will be one that is as cheap as possible.
- **Scalable:** The lack of infrastructure in developing nations is an issue for deploying large scale solutions. Previous initiatives did not take this criterion into account. For example, it may not be feasible, or even possible, to expand on and mobilize global youth conferences or a global broadcast. Ideally, a solution will be as effective on a small scale (ie. village-level) as it is on a large scale (ie. global level).

- **Ease of Implementation:** Solutions should be easy to deploy and easy to use, since skilled personnel are in shortage in developing nations.
- **Verifiable:** Any solution claiming to solve the problem at hand must be able to show that it is so using some form of metric.

While previous solutions have been somewhat effective and have received global recognition, they all suffer from one inherent flaw. Each of the solutions described previously were solutions imposed by the developed world onto the developing world. While they each try to tell a story to those in the developed world, they cannot rid themselves of the inherent bias and censorship prevalent in first world media outlets. As such, these solutions have a weakness in the ability for viewers or participants to identify with the underprivileged.

Cheap, portable electronic implementations such as video cameras, along with the use of existing global communications infrastructures via the internet will allow the underprivileged to share their stories to developed nations with no bias or media censorship. It will be more personal than Nachtwey's approach, yet is more suited to forming the kind of emotional bonds required to counteract the bystander effect. Such a solution will not require prohibitive sums of money, is easily scalable, and very visible – thus embodying the principles of a trimtab design.

OUR APPROACH TO A SOLUTION

In recent years, the internet has experienced one of the greatest booms in the history of existence; the revolution of Web 2.0, whereby the individual has more power than ever before. Web 2.0 describes the new technology in internet design that has allowed for services like YouTube, Wikipedia, Digg, OurMedia, MySpace, Facebook, and a plethora of other blog and special interest sites. The immense successes of these enterprises indicate that this technology truly speaks to our generation and is a very effective method of communication. Our solution proposes to deal with the global bystander effect by utilizing this technology to share the stories of those living in developing countries with the rest of the world without any censorship or interpretation. We wish to provide communities in developing countries with the means to capture their lives and interests in either audio, pictures, or video and share them with the rest of the world.

Many organizations in our society develop documentaries and infomercials that attempt to show us the lives of those living in harsh conditions where food and water is scarce, and corruption is rampant. Some Hollywood movies have also attempted to encourage people to take action on important issues in our world, but we still have difficulty, as a developed nation, to empathize with

the impoverished and relate to their lives, thereby recognizing them as human beings. In addition, producers and actors involved in the movies rake in large profits, while the societies and people on which they based their movie continue to suffer.

A classic example of this is Robert Flaherty's 1922 film *Nanook of the North*, marketed to be a film on the life, love, and struggles of the Inuit people in the Canadian Arctic. The film was a silent documentary on the particular events experienced by an Inuit family; however, as Duncan notes in his essay on the film, a number of the scenes in the movie are inaccurate and staged (11). Therefore, the movie succeeds in its entertainment value, but fails to provide an accurate picture of what life was really like for those people. This means that people who went out to the cinemas to watch this movie ate popcorn, drank soda, had a good time, and went home happy after an entertaining hour of watching natives build igloos and hunt wildlife.

Movies and media that are created by us, developed nations, about foreign developing nations face this same problem, they are created to entertain us, they show us what we want to see, but they do not show us what the people in the developed nations want us to see. All our media from the developing world is taken from the perspective of an outsider looking in, when in fact, the most effective media is produced by the very people whom the media focuses on. It is this reason that Web 2.0 applications have become so popular; for the first time in human history, media has become an open-access phenomenon whereby people can share their own stories and experiences with the world, regardless of whether or not they hold a degree in journalism, photography, or film production.

In the case of our problem, it is currently not possible for the impoverished in the developing world to share their stories because the infrastructure and resources to do so is non-existent. Therefore, before we can create an online community where people can share their media with the rest of the world, we have to enable the people living in developed countries with the means to capture their lives and experiences for the world to see.

AN OVERVIEW OF OUR SOLUTION

There are three major parts to our solution that are necessary to combat the issue of the global bystander effect:

1. An inexpensive, durable, self-powered, network-capable communication device that can form ad-hoc networks in regions where no other infrastructure is available that can capture pictures, movies, and audio, allow the user to edit and delete the clips, and automatically

upload content to an online community similar to YouTube. The device will also have a simple GPS receiver that stamps clips with a geographical position and time upon capture. The device will also be able to provide feedback to its users on how well their media is received in the online community. This device essentially serves as a stripped-down cell phone or an OLPC laptop that is more mobile and more convenient to use and is designed solely to take pictures, movie clips, and audio.

2. A communication network that will allow multimedia to be uploaded to the internet, while being reliable and flexible. The network will likely be a combination of ad-hoc and centralized networks similar to the networking system employed by the OLPC project.
3. An online community that serves a portal to the media contributed by people using their media capture devices. The website will feature an interface whereby people can select a geographical region and view content recorded from that area. Users also have the ability to rate and tag content thereby filtering media so that the most relevant media can be given a higher priority to the viewers. Users will also be able to provide feedback to the people who created the media thereby enabling 2-way communication.

1ST COMPONENT: THE DEVICE

The device allows locals in developing worlds to record videos and capture images that tells their story and lifestyle so that it can be shared with the developed world viewers. The three criteria with the greatest influence on the design of the device are portability, durability, and cost. Portability is measured by the size of the device and it is significant since the device is meant to be carried by the locals during their daily routine so it should present minimal obstruction to their activities. Durability is assessed by the lifespan of the device before its components fail and is no longer able to capture and share media. Cost is a heavily weighted criterion since it has a direct influence on the number of devices that can be sent to developing nations with a given amount of funding. This will directly impact the number of videos and images uploaded to the website and consequently affect the amount of donation that will be received for project expansion. Thus it is our goal to produce a recording device costing \$50 or less.

The proposed recording device contains no new technology and is in essence, a simplified combination of a modern camera cell phone and the XO laptop by the One Laptop Per Child Organization (OLPC).

In order to serve its purpose in the solution, the device must have the following functions:

	Function	Purpose
1	Audio/Video recording	Generating media files to share
2	GPS tracking	Provides a time stamp and approximate geographic location of where video is recorded
3	Wi-Fi capabilities	Allows connection to the mesh network so videos can be uploaded and shared
4	Monitor	For users to view and assess their own media
5	Multiple Methods for Charging	Permits use in locations of limited infrastructure for AC supply
	Pull cord	
	Solar panel	
6	AC adapter	Prevents invasions of privacy
	Recording indication	



FIGURE 4 - THE TABLE AND GRAPHIC ABOVE IDENTIFY THE MAJOR FEATURES OF THE PROPOSED DEVICE, AND THE REASONS BEHIND THEM.

The cell phone provides an important reference design for the video and audio recording function, as well as GPS tracking. Most cell phones today are equipped with inexpensive cameras that enable users to capture images and record video clips with acceptable quality. Basic GPS tracking is also included in modern cell phones so that the Enhanced 911 system can trace the location of emergency calls (12). Most importantly, the cell phone demonstrates that the functions described above can be fitted into a compact and mobile device for a retail price in the range of \$100 - \$200. Thus, without profit and features that are unnecessary, it is reasonable to produce a \$50 recording device with the stated functions.

The XO laptop is designed to be an inexpensive and durable machine that facilitates learning in the developing world (13). The laptop created by OLPC provides reference for three important features in the device:

1. Wi-Fi network capability
2. Multiple power supplies
3. Durability and resilience

The XO laptops have demonstrated a successful mesh network where the devices can all communicate within the network and gain access to the internet if one machine is connected to a server (14). The devices can be powered in a variety of methods including, a foot pedal, pull cord, solar panel, and AC adapter (14). This allows the device to perform in areas where infrastructure is limited and power supply is not easily accessible. The laptop is designed for outdoor use, therefore it is exceedingly resilient to the forces of nature. The keyboard is resistant to dust and water due to a rubberized membrane seal and the hard casing makes it resistant to shock (14).

2ND COMPONENT: THE NETWORK

The network that will be implemented is a mesh network formed by the recording devices. A mesh network is a communication network where all nodes can propagate signals and signals are relayed from computer to computer to reach their destination (15). (See Figure 5 below) This form of wireless network will serve as a link between the developing world and developed world as it allows media captured by locals to be transmitted and showcased to the developed world viewers. The viability of this network has been demonstrated by the OLPC project, which has been launched in Uruguay, Brazil, Nigeria, and Thailand (16).

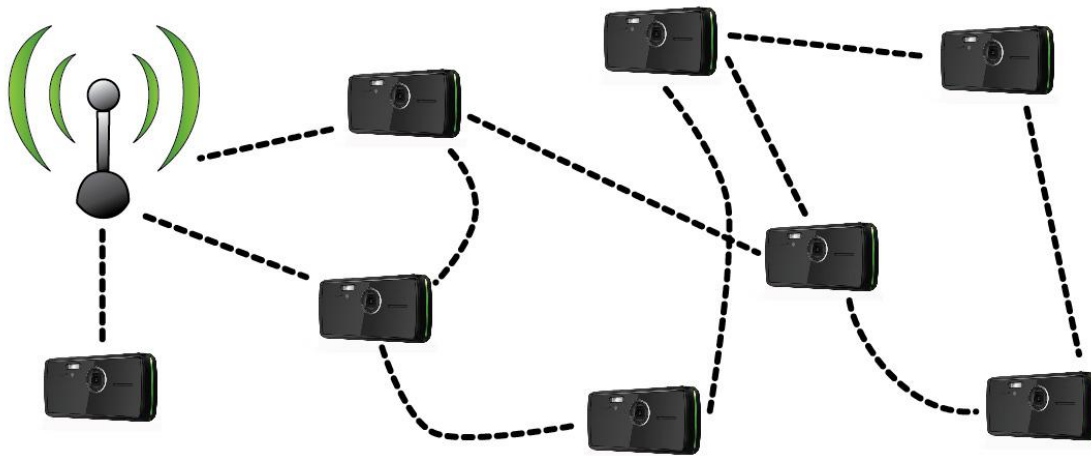


FIGURE 5 - THIS GRAPHIC ILLUSTRATES A POSSIBLE MESH NETWORK IN WHICH ALL DEVICES ARE CONNECTED TO THE INTERNET. SOME ARE CONNECTED DIRECTLY, WHILE OTHERS ARE CONNECTED THROUGH OTHER DEVICES.

The main features of the network are:

- **Self-Healing** – When one device goes offline or leaves the area, the network reconfigures to maintain all devices still in the vicinity
- **Single Access Point** –As long as one device is connected to an access point, all the devices connected via the mesh network will access to the internet
- **Strength in Numbers** – The more devices operational, the larger the network area becomes

3RD COMPONENT: THE WEBSITE

Our proposal utilizes the power of the Web 2.0 applications to bring the people in developing and developed countries closer together. It includes an open-access website, specifically designed to showcase the media captured by the proposed devices in developing countries to people all over the world.

The website has several features:

- Voting / Ranking System
- Interface for users to post, read and rate others' comments
- Flagging for inappropriate content
- A system to accept online donations

These features are what make our site open access; they allow users to manipulate the content and the appearance of the site as they see fit. The success of websites such as Wikipedia, Digg, and OurMedia show the power of open-access communities and demonstrate that these projects are feasible.

We will not be implementing any new technologies and designs in our site since all major features have already been implemented in other Web 2.0 applications. Thus, we will simply be combining features from already existing sites.

Figure 6 displays the first prototype of the homepage of the Pangaea Ultima website. YouTube heavily inspires the layout of the page. Its purpose is to allow users to quickly get an idea of what the website is about, and to start watching videos of the developing world right away.

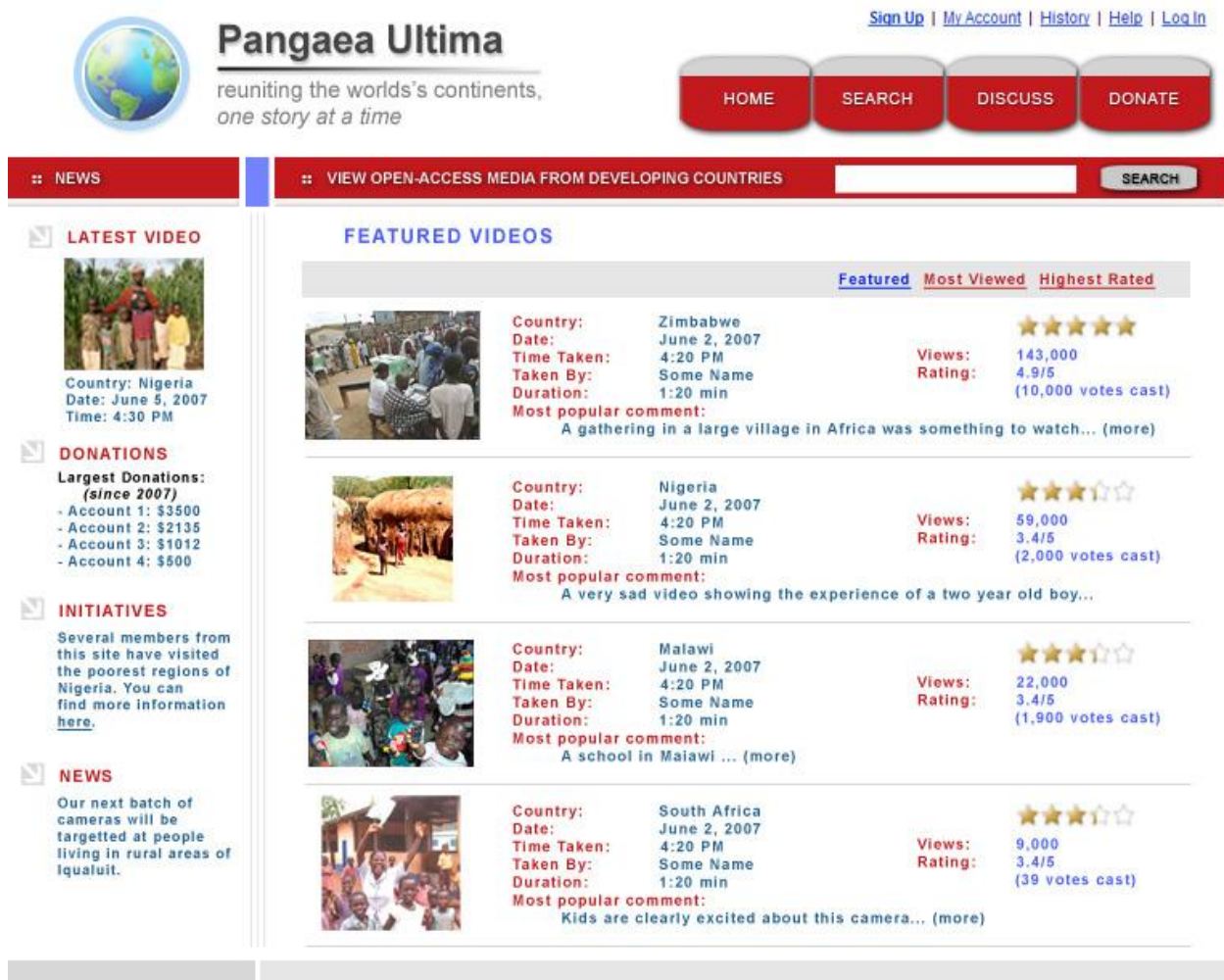


FIGURE 6 - A SIMPLE PROTOTYPE OF THE HOME PAGE OF THE PROPOSED WEBSITE.

Each video block on the homepage displays valuable information such as the poster's name, video's location, time, and duration. Additionally, each block displays the "most popular comment" about the video, to give a user an idea of what it might be about. Each block also displays the rating, in addition to the total number of ratings and the number of views the video received. All of this information helps the user judge the quality and popularity of the video as well as whether or not they want to see it.

The left-hand-side of the main layout is reserved for website news and announcements. It displays the latest videos, and news about our project and initiatives. This is in place to keep our regular users up-to-date about the progression of our project.

In addition to the typical features of Open Access video sites, our site builds on the GPS technology embedded in our devices by including several extra features, such as allowing users to see exactly where videos were taken and to search for videos by geographical location. Figure 7 displays the search pages of the site, showing how users can easily browse videos by location, as well as keywords.

Figure 8 displays the main video page. Again, this page is influenced heavily by YouTube. It contains the video, as well as the information relating to the video. At the bottom of the page, users are able to post comments and read what other people have to say about the video. The ability for users to post and read comments is very important as it develops a sense of community within the site. It allows users to interact with the community and encourages them to come back to the site.



FIGURE 7 - THIS FIGURE DISPLAYS THE METHODS IN WHICH USERS MAY SEARCH FOR CONTENT, USING EITHER KEYWORDS OR GEOGRAPHICAL LOCATION.

FIGURE 8 - THIS FIGURE DISPLAYS A SAMPLE WEBPAGE FOR UPLOADED CONTENT.

If, at any time, a user spots a video that they finds inappropriate, they will be able to flag it.

If a video receives a significant amount of flagging, it will be reviewed, and removed if necessary.

This system is in place to keep the content of the website appropriate.

Our website will also feature a donation page. The purpose of the page is to gather funds from people who are interested in our project and use them to distribute more devices to the developing world.

Initially, the site will be targeted at humanitarian organizations who should be interested in our novel idea. With time, we are hoping that the site will be able to attract media attention. Judging from the popularity of sites such as YouTube in developed countries, we are hoping that if we bring this concept out to the developing world, the popularity will pick up quickly there as well.

VALIDATION: MODELLING & SIMULATION

To verify our solution quantitatively, a model and simulation was created using MathWorks Simulink®. Our model has three main components:

- The community of device users
- The community of website viewers
- The website

Each component is modeled by an internal mechanism and produces a set of outputs. The outputs are dependent on embedded parameters and the value of inputs. The components interact with each other by parsing interrelated parameters. See appendix A for technical details.

THE MAIN LIMITATIONS OF THE SIMULATION

A quantitative model of such a complex socioeconomic problem will inevitably be limited in its scope and function. To better understand the scope and merits of this model, and to ultimately demonstrate the feasibility of our proposed solution, we must first understand the major limitations of the model:

- I. **Empathy cannot be measured** - the aim of our solution is to increase the level of empathy, but this important parameter cannot be directly measured. Measuring the level of empathy is analogous to measuring the amount of beauty. While there is often a general consensus, there is no numerical value. This is a very difficult problem for a numerical model.
- II. **Some parameters cannot be determined** - Many parameters are used in our model. Through research and common sense, some parameters can be determined to reasonable accuracy but other parameters such as the parameter indicating how the films attract viewers and the parameter indicating the donation behaviors of the viewers cannot be empirically determined. As a result, the model does not allow us to determine for certain the outcomes of the project.

The first limitation was addressed by measuring the effect of an increased level of empathy. Specifically, the amount of donations in dollars and the number of operational devices were used as indicators of the solution's level of success.

We addressed the second limitation by assuming reasonable values for those parameters and testing their effects. Some assumptions are reasonable approximations of the real values but some others are still arbitrary, based on educated estimates. Although the model still does not allow us to determine the outcomes for certain, it does allow us to identify what parameters are important and what parameters have low tolerances. Thus, the model still helps us to understand how our plan works and what the main dependencies of the success of our solution are.

THE RESULTS OF THE SIMULATION

Observing the difference in outcomes while varying some parameters allows us to identify the relative importance and the relative sensitivity of the parameters. The relative sensitivity indicates how much the outcome is affected by small variations in that parameter. Refer to Appendix B for a case study using three independent simulated scenarios.

After analyzing the outcomes with different parameters, we identified the relative importance and sensitivity of parameters. This enhances the understanding of the solution and points at some implementation strategies. A few notable points are:

- Initial funding is very important because it directly determines the scale of the project and its ultimate success.
- The cost and maintenance fee of the device is very important. With a cheap, maintenance-free device, the project becomes relatively easy. On the other hand, if one in a hundred devices break every day, the project will be very difficult to implement.
- The implementation strategy is important especially with smaller initial funding. The funds spent on building and delivering devices should match the funds spent on attracting viewers so that the maintenance is manageable.
- The outcome is relatively insensitive to the number of initial viewers. It does not make much difference whether there are 5 or 50 viewers initially. However, it does make a difference when the difference is between 5 and 5000.

With the limitation in scope and function firmly in our minds, and with reasonable assumptions made for some parameters, the model shows that our solution works under a range of conditions and thus allows a range of assumed parameters. So as long as a value within the range represents the reality, the model demonstrates that our solution is indeed feasible by showing how its implementation behaves quantitatively.

CONCLUSION

Our research has shown that there are a great number of socio-economic problems facing humanity. The majority of these problems cannot be solved with devices from the realm of science and engineering. However, many of these problems have already been solved or are under control in the first world. Instead of targeting the problems directly, we have narrowed the problem down to the bystander effect. By allowing those in the first world to better identify with those in the third world, we hope to increase awareness of the many problems facing humanity, and eradicate our indifference towards others. This newly instilled compassion should lead to more effective aid towards humanity's greatest socio-economic problems.

Solving the global bystander effect is not a straightforward task. Previous initiatives have been able to produce some results in increasing first world empathy towards the developing world, but many of them suffer from inherent first world media bias and censorship. To fully tackle the inability for people to empathize with their underprivileged counterparts across the world, this project has proposed an open access media system aimed at developing world citizens.

The system, titled *Pangaea Ultima*, consists of three components – a video recording device, a scalable mesh network, and a web site for viewing the media across the world. This system will give the citizens of the developing world the ability to share their own story, without the gloss of first world media. Only then can the first world begin to identify with the underprivileged, and only then can humanity hope to solve its most pressing problems.

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APPENDICES

APPENDIX A: SIMULATION – TECHNICAL FIGURES

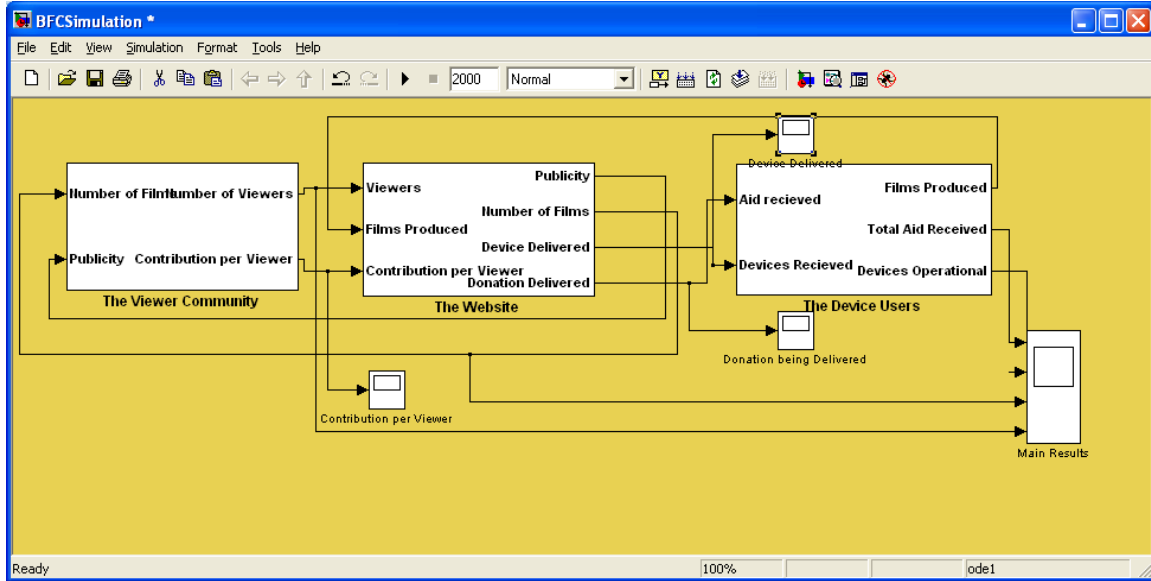


FIGURE A.1 - THE RELATIONSHIP BETWEEN COMPONENTS.

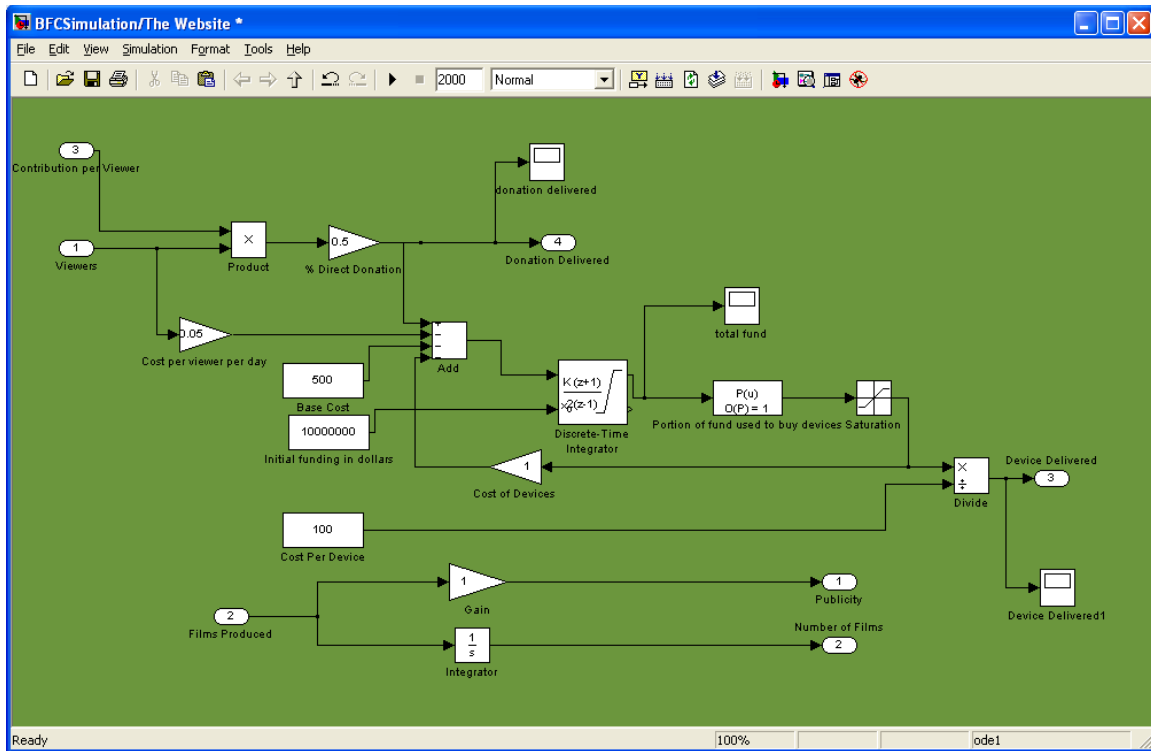


FIGURE A.2 - THE WEBSITE.

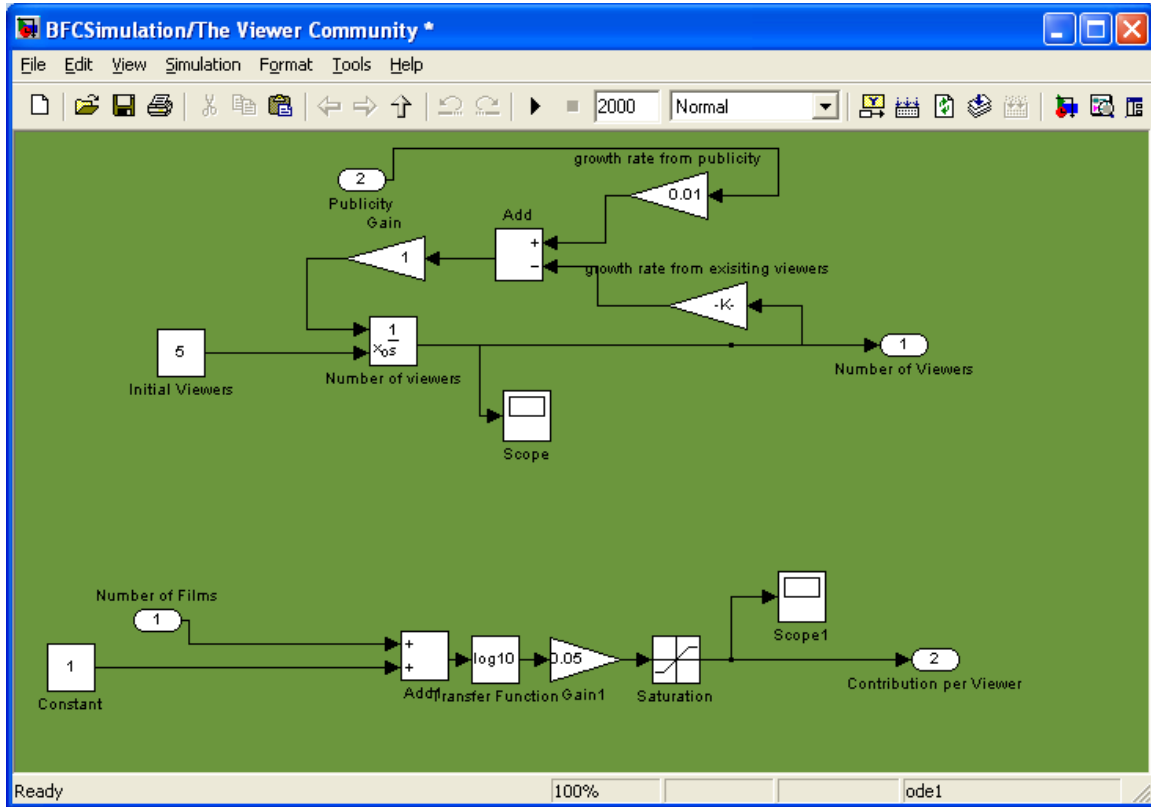


FIGURE A.3 - THE VIEWER COMMUNITY.

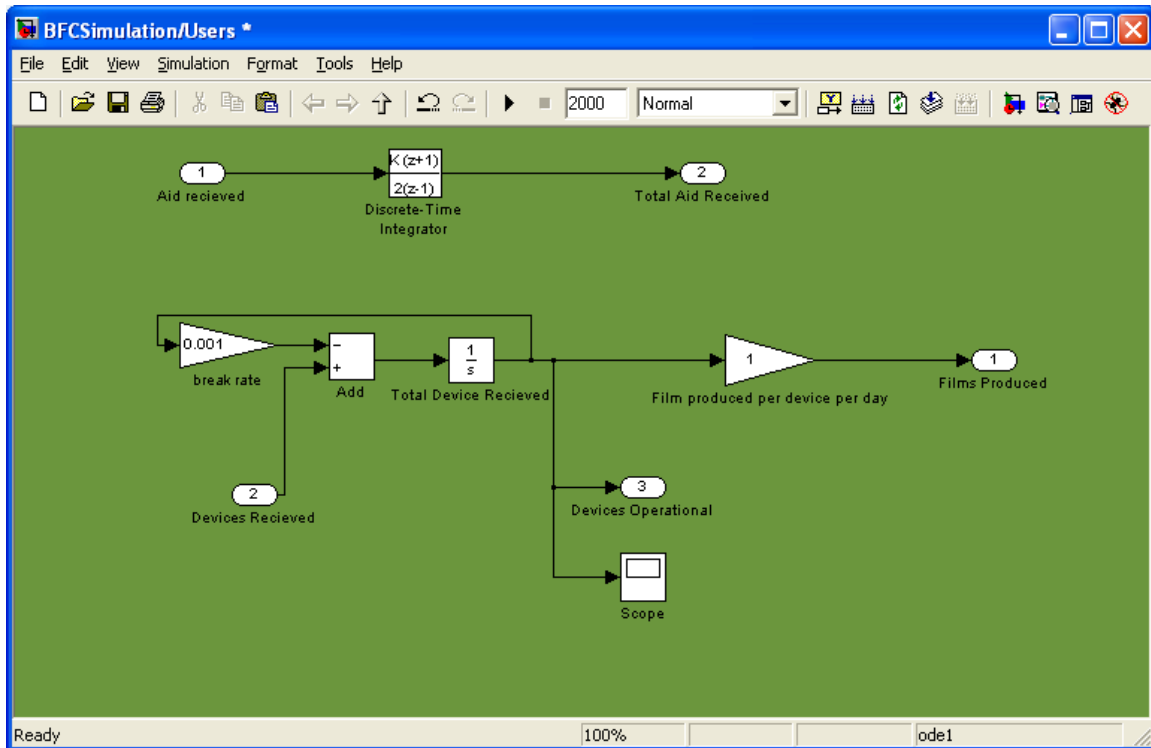


FIGURE A.4 - THE DEVICE USERS.

APPENDIX B: SIMULATION – A SIMPLE CASE STUDY

Scenario 1: Failure

The y-axis is in dollars for donation delivered and the x-axis is the time in days passed since the conception of the project. Here we start with \$100,000 and attracting donations from humanitarian organizations. An initial 750 devices are bought and become operational soon afterwards.

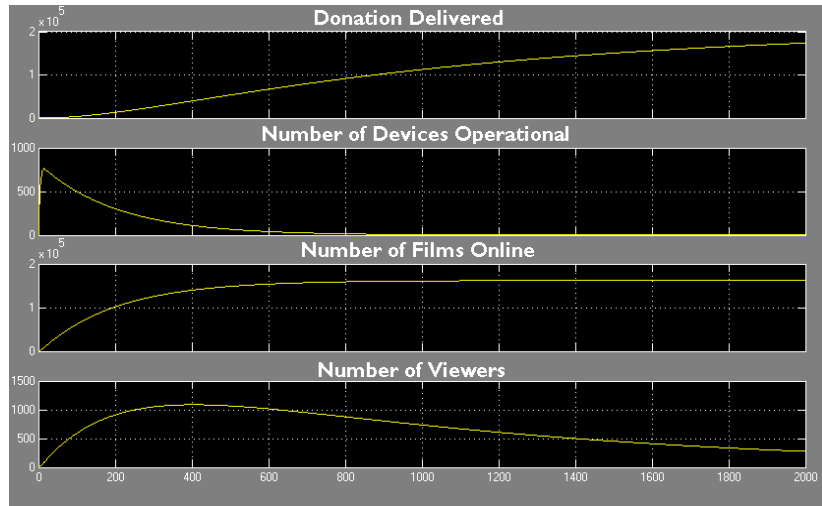


FIGURE B.1 - OUTCOME OF SCENARIO 1.

Films are now being uploaded online attracting viewers and more donations. However, the amount of donation attracted is not enough to pay for the maintenance of the devices and network so the number of operational devices drops. As a result, no new films are uploaded online, viewers lose interest and donations are no longer being delivered. Here the total donation generated is \$200,000 but the project fails because of maintenance failures.

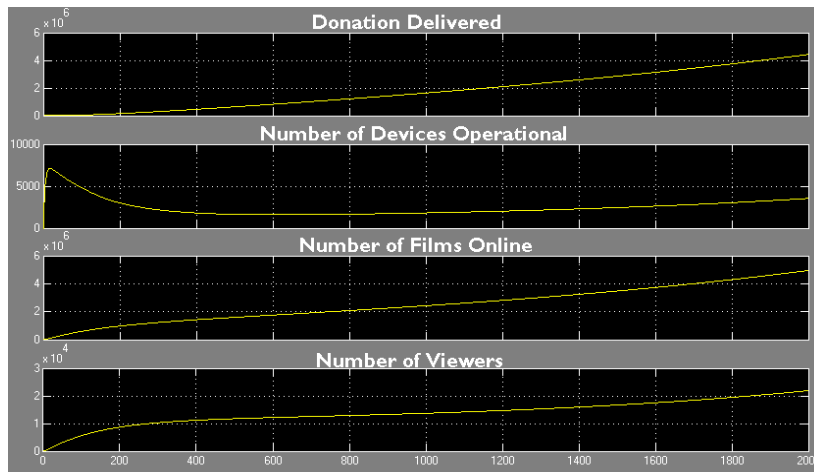


FIGURE B.2 - OUTCOME OF SCENARIO 2.

**Scenario 2:
A More Successful Case**

Here, all parameters are the same as the previous case except for a larger initial funding of \$1,000,000 instead of \$100,000. The results are more positive since viewer growth is more rapid, allowing for the maintenance of a steady number

of devices. The donation generated is \$6 million after 6 years, much larger than the \$1,000,000 initial funding. The initial dive in the number of operational devices is dependent on the implementation strategy. Here a large number of devices are bought and delivered at the very beginning. This strategy exhausts the initial funding quickly while the viewer base is small (5 viewers at the start). With sufficient funding, a better implementation strategy would avoid the

waste of devices by distributing the devices at a slower rate and spending more funds to attract more initial viewers.

**Scenario 3:
An Even Better Case**

As above, all parameters the same but with an even larger initial funding (\$10,000,000), the outcomes are very positive under this model. The total donation generated is more than \$240 million after 6 years' implementation. However, the model becomes exponential afterwards and nears its limitation in scope.

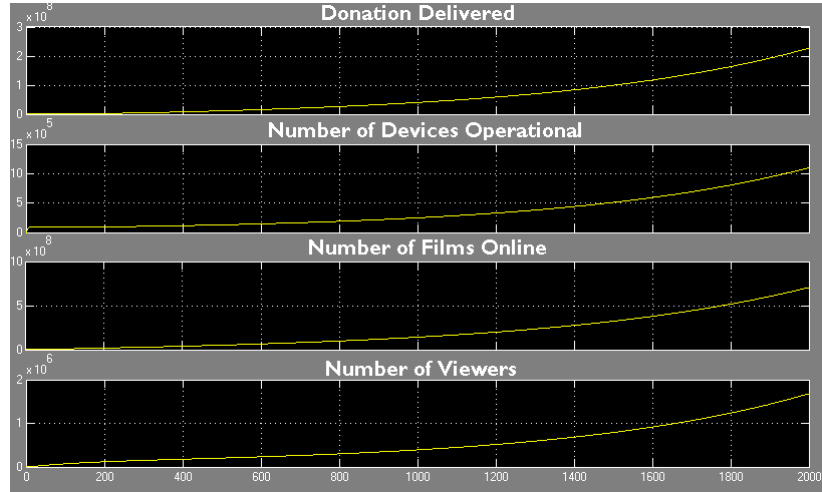


FIGURE B.3 - OUTCOME FOR SCENARIO 3.

APPENDIX C: IMPLEMENTATION CHALLENGES OF PRESENT SOLUTIONS

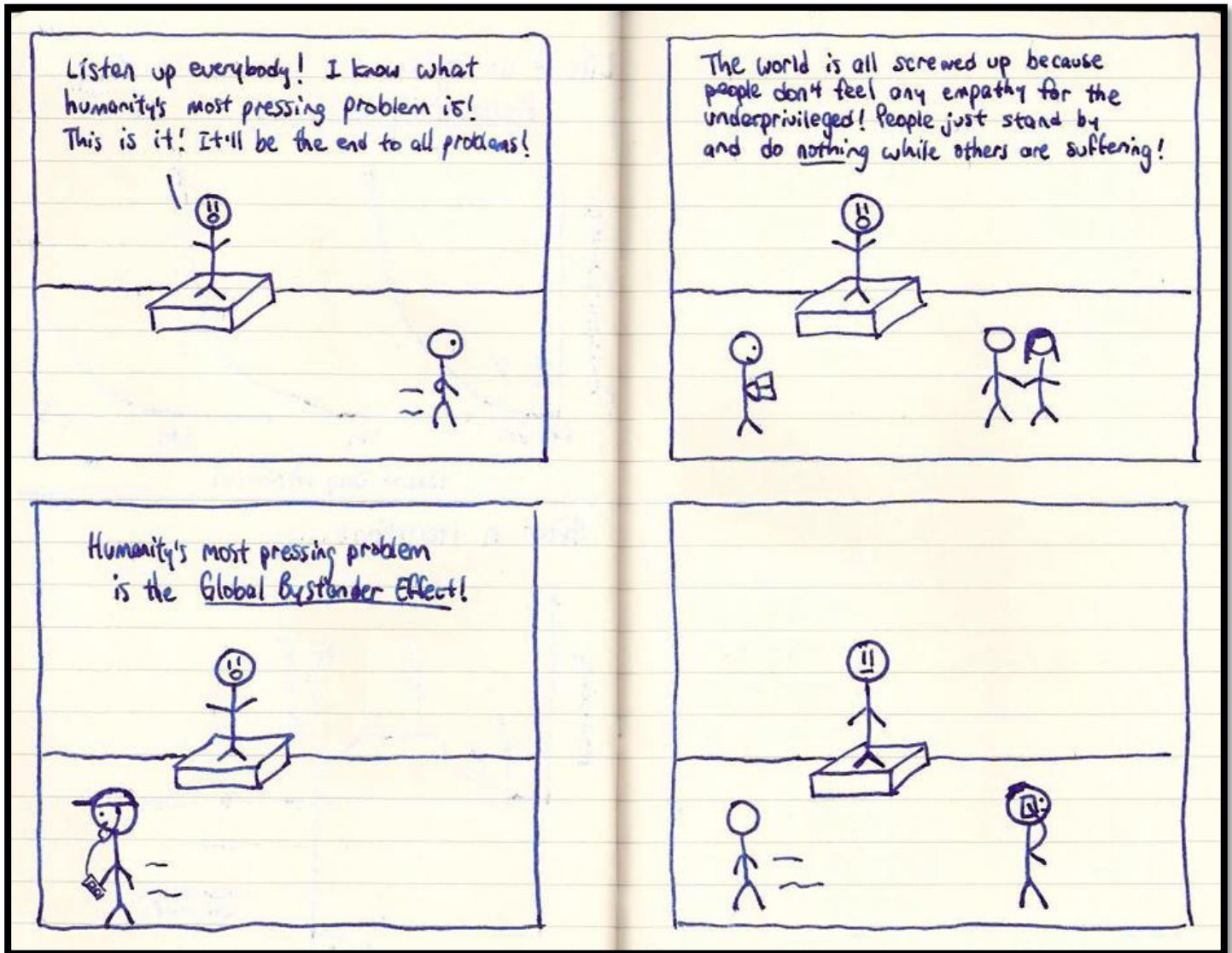


FIGURE C.1 - THIS COMIC IS INTENDED TO ILLUSTRATE THE MAIN ISSUE OUR PROPOSAL DEALS WITH, AND ITS INHERENT CHALLENGES HINDERING A SUCCESSFUL IMPLEMENTATION.

Figure C.1 stresses the importance of our solution being uniquely different from present approaches to solving the global bystander effect as it displays the irony of what befalls current initiatives. We hope that open-access media is the better solution in that it lets developing nations tell their own story, rather than having someone else interpret and share it on their behalf.