MyLight: The "One Stop Shop" for the Average Philanthropist

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Abstract

MyLight is a web application designed to serve as the "one stop shop" for the average philanthropist looking to donate to non-profit organizations online. It recommends charities to users based on their personal charitable interests, visualizes data about them in an easy-to-understand way that inspires action, integrates current events about charities in the news, and contains social functionality to help users stay connected to fellow donors. This paper discusses related charity-finding products before detailing the ways in which MyLight differentiates itself as a truly integrated solution. It also discusses the technical implementation of the application, as well as ways in which it was evaluated, before culminating in a discussion of potential improvements that could refine MyLight's ability to empower everyday philanthropists in the future.

1. Introduction

Last year, the amount of overall charitable giving around the world was up 3% from the year before, with *online* charitable giving up by 9% [17]. Furthermore, individuals — as opposed to foundations, grants, or corporations — accounted for the largest majority of contributions; a remarkable 72% of total contributions in 2013 came from individuals [13]. These figures highlight not only the rich altruistic spirit of the global community, but also the collective power of individuals to make positive change. The World Bank recently predicted that, by the end of 2015, "the number of people living in extreme poverty around the world is likely to fall to under 10 percent of the global population" [3].

While this is a remarkable fact, as long as the percentage of people living in extreme poverty remains above zero, there is still room for more action to be taken. Proponents of effective altruism, a growing social movement, believe that "with the rise of evidence-driven interventions, we each have an unprecedented opportunity to save lives and prevent unnecessary suffering" [6]. Related outreach organizations like The Life You Can Save assert that some deaths related to extreme poverty are entirely preventable by supporting high-impact charities, especially since some poverty-related diseases can be treated among children for as little as fifty cents per child [10]. However, even if the average philanthropist possesses a desire to donate money to these and other worthy causes, it can be hard to identify related organizations to support that have the ability to do the most good.

Some individuals may avoid donating to a particular charity if they feel like the organization has high overhead or administrative costs. One study found that people were more likely to donate to an organization if they knew that "the charity had already secured donations to cover its overhead costs, so every subsequent dollar donated was going directly to programs" [13]. Donor uncertainty about the allocation of charities' funds was a major headline earlier this year when NPR released a special report exposing the Red Cross's mismanagement of resources in the aftermath of the 2010 earthquake in Haiti [18]. Thus, skepticism about the efficacy of charitable organizations and the allocation of their funds is a valid concern for many potential donors.

A donor looking to contribute to a charity online also faces a plethora of options. According to the National Center for Charitable Statistics (NCCS), roughly 2.3 million non-profit organizations operate in the United States alone [2]. It can be daunting to comb through the vast amount of information available online about charities in order to find organizations that not only appeal to a one's personal interests but are also impactful.

As will be discussed further in Section 2, a variety of web services have risen in recent years to address different parts of the problem of finding and learning about the best, most effective charities online. MyLight is a web application that attempts to unite the strengths of each of these services in order to create a "one stop shop" for the average philanthropist looking to donate online. Its goal is to empower donors by (1) making it easier to find effective, personally-tailored non-profit organizations to support, and (2) presenting information about these organizations in a clear and integrated way that inspires action.

The remainder of this paper elaborates on various aspects of MyLight and is organized as follows. Section 2 assesses the strengths and weaknesses of a few existing products related to MyLight, while Section 3 introduces four key differentiating features of MyLight itself. Section 4 describes four primary workflows or use cases of the application, with references to accompanying screenshots. Section 5 details the implementation of MyLight, including its general architecture and the process of its engineering. Section 6 discusses the three ways in which the application was evaluated, and Section 7 concludes by articulating key learnings from the process of creating MyLight and provides a vision for the application's future use.

2. Related Work

A number of web-based platforms have risen in recent years to make it easier for donors to find and learn about the best, most effective charities. Some of these platforms seek to collect high-quality data about charities, whereas others seek to analyze or evaluate them in some way. In general, there are three basic types of such platforms: (1) data sources, (2) charity evaluators, and (3) integrated solutions. This section discusses the strengths and weaknesses of a few of the most prominent platforms that fall under these categories; namely, the NCCS, GuideStar, Charity Navigator, CharityWatch, GiveWell, and JustGive.

2.1. Data Sources

The National Center for Charitable Statistics (NCCS) and GuideStar are two of the most prominent data sources for information about non-profit organizations in the United States. The NCCS, a part of the Urban Institute, labels itself as the "national repository of data on the nonprofit sector in the United States" and seeks to distribute high-quality non-profit data for "use in research on the relationships between the nonprofit sector, government, the commercial sector, and the broader civil society" [2]. It builds databases of financial and transparency information on non-profit organizations that it makes available for research use. In fact, the charity data that is used to power the MyLight application comes from the NCCS, made available for free via the Princeton University library.

GuideStar collects much of the same financial and transparency data that the NCCS does. However, instead of simply compiling databases of information, it also packages charity data in the form of free and paid APIs that are used to power a number of other services like AmazonSmile, JustGive, and Network For Good. It also claims to be the "world's largest source of information on nonprofit organizations" [1].

Apart from the fact that GuideStar offers an API, as well as the fact that it lets users simplistically search for charities on its website, neither the NCCS nor GuideStar offer users a way to find the most effective charities that suit their personal interests. Rather, both websites function primarily as *sources* of high-quality charity data, upon which other applications (including MyLight) can build more fully-featured platforms.

2.2. Charity Evaluators

Charity Navigator, CharityWatch, and GiveWell are three of the most popular charity evaluators. Each of them uses data about non-profit organizations to assess their relative efficacies in some way.

Charity Navigator claims to be the "the nation's largest and most-utilized evaluator of charities" [5]. It examines the financials of thousands of charities and assigns each of them a rating on a 4-star scale based on its financial health, accountability, and transparency, all in an effort to help users gauge which organizations are relatively more effective than others. By offering these ratings, Charity Navigator aspires to "advance a more efficient and responsive philanthropic marketplace" [5]. Users can search for specific non-profits, comment on them, and obtain quantitative summaries of their financials. If a user has an account with the site, he or she can also save an organization to a personal portfolio of "favorites" and compare two organizations side-by-side.

CharityWatch offers users similar functionality to Charity Navigator but focuses on two different metrics. Instead of looking at an organization's financial health and accountability, CharityWatch looks at the percentage of a charity's expenses that are spent on its programs, as well as the amount of money it spends in order to raise $100 in donations. Using these two key metrics, along with several other more holistic factors, it assigns organizations a grade-letter rating from A+ to F. It presents information in much the same way as Charity Navigator, as a mostly quantitative report, but does not offer users the ability to "favorite" charities.

GiveWell, the last of the most prominent charity evaluators, is most distinct in its work from the other two organizations. Instead of looking at thousands of charities and assigning them ratings based on a few key metrics, GiveWell performs in-depth research on the top 3-5 charities that, according to its criteria, stand out the most. Its research aims to "determine how much good a given program accomplishes (in terms of lives saved, lives improved, etc.) per dollar spent" [7]. Because it is only focused on recommending the top few charities that, in its estimation, do the most good per dollar, GiveWell presents its information in a purely report-like fashion.

While the three services described above each have their own strengths and weaknesses, none of them provides a truly integrated solution to the problem of finding and learning about the most effective, personally-tailored charities online. While Charity Navigator and CharityWatch both offer ratings that help users distinguish between effective and non-effective charities, neither of them offers functionality to connect users to charities based on their personal interests. Charity Navigator comes close by offering the ability to search for charities within specific categories, but it does not dynamically recommend charities to users using more advanced recommendation techniques (such as the ones which will be discussed later in this paper). In other words, when a user "favorites" an organization, Charity Navigator merely adds it to a portfolio that the user can view later; Charity Navigator doesn't analyze the portfolio to recommend related charities.

Furthermore, despite excelling in identifying the best, most effective charities, GiveWell is limited in its ability to recommend charities beyond the top 3-5 upon which it has performed in-depth research. It does not take the user's personal interests into account and does not present its charity information in a visually compelling way.

2.3. Integrated Solutions

Apart from data sources and charity evaluators, the final category of web-based charity platforms are those that aim to provide an integrated solution to the problem of finding and learning more about charities of interest online. These platforms are ones that provide multiple core functionalities and suffice as “one stop shops” for the average person looking to donate online. Using this definition, the aforementioned products cannot be called integrated solutions. The data sources *only* provide data about non-profit organizations, and the charity evaluators, while broader in functionality, do not offer functionality other than presenting charity information in a more report-like, evaluated fashion (with a 4-star or grade-letter rating).

Arguably, the only well-known integrated solution on the market today is a web application called **JustGive**. It bills itself as “*the* destination for online charitable giving” and aims to “increase charitable giving by connecting people with the charities and causes they care most about” and “creating comprehensive tools and services to make charitable giving a part of everyday life” [9]. In theory, JustGive’s mission seems to share a great overlap with the goals of MyLight. However, in reality, JustGive mostly focuses on offering users a variety of ways to donate online (ex: via gift cards, registries, or through corporations). It also offers a number of features for non-profit organizations themselves, such as the ability to track donations, organize a fundraiser, set up a donation profile, etc. For users looking to find charities, however, its features are more limited. Users can search for charities near their zip code, or search for specific organizations by name. Information about charities is presented in a pop-up window in an entirely qualitative, report-like manner. Users can also read reviews of organizations written by other members of the site, a feature similar to the commenting feature offered by Charity Navigator.

While JustGive is a valuable platform for users looking for innovative ways to donate money, or for charities looking to join a network of other non-profit organizations, it does not connect users to charities based on their personal interests and does not present information about them in a visual way.

3. MyLight's Approach

The previous section examined the strengths and weaknesses of a few prominent web-based platforms that attempt to help users find and learn more about effective charities that they might be interested in. This section describes four key ways in which MyLight builds upon and differentiates itself from those platforms: (1) personalized recommendations, (2) visualization of charity data, (3) integration of news articles about charities, and (4) social functionality. Together, these four core functionalities make MyLight an integrated, "one stop shop" solution.

3.1. Personalized Recommendations

MyLight connects users to an initial set of relevant charities based on their personal interests and subsequently recommends additional charities using collaborative filtering algorithms. These additional recommendations are generated as users "favorite" more and more of their initially recommended charities. For example, for a given user X, the application finds other users ("neighbors") with similarly favorited charities and recommends to user X the additional charities that its neighbors have favorited that user X has not favorited. Thus, there are two types of charity recommendations that MyLight provides: (1) initial recommendations based on a user's charitable interests (ex: environment, health & medicine, etc.), and (2) additional recommendations based on a user's favorite charities.

3.2. Data Visualization

As mentioned earlier in Section 2, MyLight is powered by charity data provided by the NCCS. This data is primarily financial in nature but can be very useful to a potential donor if presented in a visually compelling way. MyLight presents the most relevant pieces of charity information — such as an organization's revenue and expenses, as well as a breakdown of both — using easy-to-understand pie charts and bar graphs and makes it easy to quickly assess an organization's financial health. Unlike related charity platforms, MyLight avoids presenting information in table form, choosing to highlight visually only the most important pieces of information.

3.3. News Integration

Further contributing to MyLight's characterization as an integrated platform, the application contains a persistent sidebar on the right-hand side of the screen that displays news articles from Bing News about one or more of a user's favorite charities. This keeps users informed about their charities of interest and places the static financial information that the application provides into a current, real-world context.

3.4. Social Functionality

The last of MyLight's four key features is social functionality. In an effort to create a community of MyLight users, the application allows users to comment on individual charities and describe their personal experiences with them. MyLight takes social functionality one step further than other platforms by introducing the concept of "friends". Users can send and accept friend requests to and from other users of the application, allowing them to view the charitable causes that others are interested in, along with the charities that others have marked as "favorites".

4. Primary Workflows

This section describes a few primary workflows (or tasks) that a user might complete when using the MyLight application. These workflows can also be thought of as different ways that users might take advantage of the core functionalities described in the previous section. In its description of these workflows, this section also provides an overview of MyLight's user interface, along with references to accompanying screenshots located in Section 9.1 of the Appendix.

4.1. Workflow 1: Generate Initial Charity Recommendations Based on Personal Interests

After creating a new account on MyLight, the user is directed to his "Profile" page (Figure 4), which presents a short survey asking him to select which of eleven charitable causes he is most passionate about. In an attempt to obtain an initial set of recommendations, the user may select one or more of these causes and save his preferences. This action directs him to the "Charity List" page (Figure 5), which lists several recommended charities based on the user's personal interests. As was described in Section 3.1, these charities form the set of *initial* recommendations that the system provides (based solely on a user's broad charitable interests). At this point, the user may click on one or more of these charity listings to view more information, thereby embarking on Workflow 2.

4.2. Workflow 2: Learn More About a Specific Charity of Interest

After clicking on a specific charity on the "Charity List" page, the user is directed to that charity's unique "Charity Page" (Figure 6). This page lists the name of the charity, along with its address, category (ex: education, health & medicine, etc.), website, and financial information. At this point, a user may note the initial data presented — about the organization's net income — and scroll down, revealing a more detailed breakdown of the organization's revenue and expenses, in the form of pie charts. Scrolling down farther, the user may find bar charts conveying the organization's balances at the beginning and end of the year (Figure 7). If the user wants to learn more about the charity, he may click on its website link, directing him to the organization's official website. Alternatively, if the user wants to bookmark the organization for later viewing, he may click on the gray star next to its name, thereby "favorite-ing" it. After the user is done viewing the organization's charity page he may return to the "Charity List" page, whose listings may have changed in response to the user's decision to "favorite" the organization he was just viewing. This leads to Workflow 3.

4.3. Workflow 3: Generate New Charity Recommendations Based on Favorite Charities

As the user looks at more and more charity pages and "favorites" those in which he is most interested, the system generates new charity recommendations based on a collaborative filtering engine. These new recommendations constitute the second type of recommendations described earlier in Section 3.1.

4.4. Workflow 4: Connect With Other Users and View Others' Charity Profiles

Over time, as the user becomes more familiar with MyLight, he may wish to connect with other users of the application. Clicking on the "Friends" tab on the top navigation bar, the user is directed to a “Friends List” page (Figure 8), which displays a list of his friends at the top of the screen and presents a search bar at the bottom so that users can add more friends by searching for their individual usernames; to accommodate privacy concerns, users may choose to be un-searchable. If the user wants to see which charitable causes one of his friends is interested in, he can click on his friend’s name, which opens a page that contains a list of causes his friend is interested in, along with a list of his friend’s favorite charities (Figure 9).

5. Implementation

This section describes the implementation of the MyLight application, including a discussion of its three-tiered architecture, the technologies used in each of these “tiers”, as well as the recommendation framework it uses to generate recommendations based on users’ favorite charities.

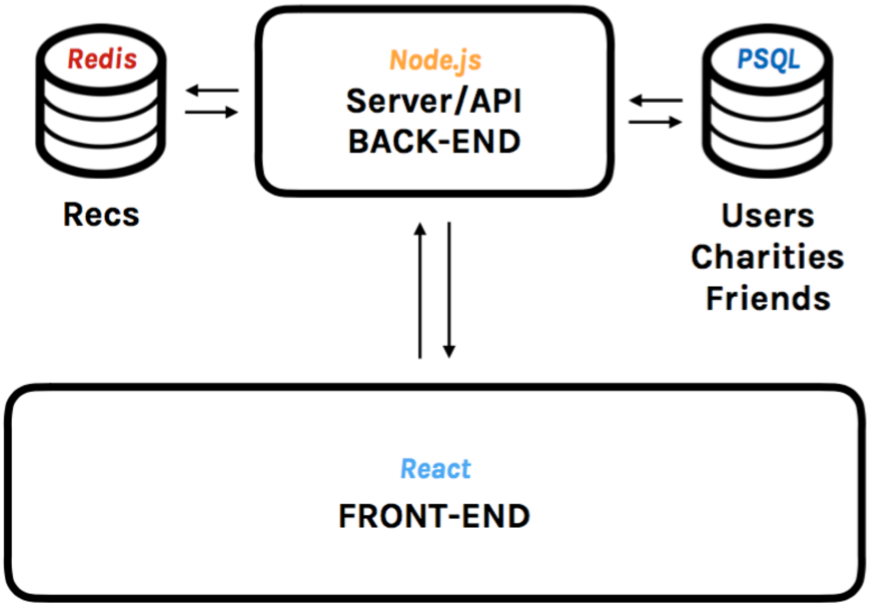
The general architecture of MyLight is similar to many other web applications, consisting of three main tiers: a back-end server and API, a database, and a front-end UI. Figure 1 shows how each of these tiers interact, with the arrows indicating directions of data flow. The following sub-sections describe each of these tiers in greater detail and explain how data flows from the database to the UI via the server/API, and vice-versa.

5.1. Databases

MyLight uses PostgreSQL, an open source database, to store information about users, charities, and friends. Each of these three entities constitutes a table (or “relation”) in the system.

Each record in the “Users” table contains attributes such as a unique user identifier (a “uid”), first name, last name, email address, and password hash. It also contains boolean attributes for each of the eleven causes that are presented to the user on his or her “Profile” page. These boolean attributes encapsulate a user’s charitable interests and are used to execute queries on the “Charities” table. For example, if a user has expressed interest in Higher Education, Health & Medicine, and the Environment, then, in order to generate his initial set of recommendations, the system executes a query on the “Charities” table that asks it to return all the charities that fall under either of these three categories.

Figure 1: MyLight's general three-tiered architecture



Each record in the "Charities" table contains dozens of attributes representing its basic metadata and financial information, including its name, address, charity type, total revenue, total expenses, amount of revenue coming from donors, amount of expenses used to compensate employees, etc. Each record in this table also contains a unique charity identifier (an "ein"). The records in the "Friends" table only contain three attributes: two uids (unique user identifiers) and a timestamp, indicating at what time two specific users became friends.

The decision to use a relational, as opposed to a non-relational, database stems from the fact that there does not exist a one-to-one mapping between users and charities. In other words, a given user may be associated with (recommended) any number of charities, some of which may overlap with another user. Thus, a given charity could also be associated with any number of users. A similar relationship exists between a specific user and his circle of friends. Thus, creating separate tables for each of these conceptual objects in the system (users, charities, and friends) allows data to remain in only one place. It also transfers responsibility to the back-end to execute appropriate SQL queries to join and combine relevant pieces of data.

5.2. Front-End User Interface

The user interface of MyLight was created primarily using React.js, a framework built by Facebook that is used to power its own website, as well as other prominent platforms on the web such as Instagram and Netflix. It offers developers the ability to quickly build "large applications with data that changes over time" [8]. It works by creating a nested hierarchy of reusable “components” that define the structure of the user interface. Data enters the UI through one of the top-most, or “parent,” components and are filtered downward through the component’s children.

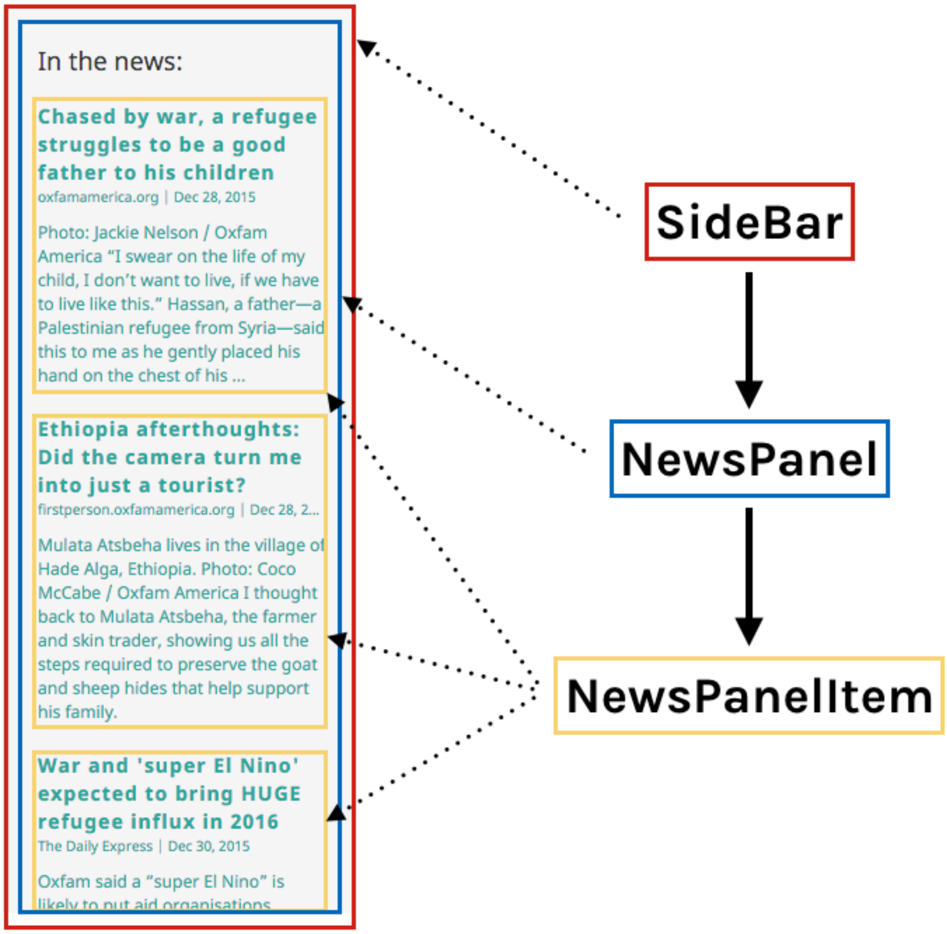
As an example, Figure 2 illustrates the hierarchy of React components used to create the UI of the persistent news sidebar on the right-hand side of the MyLight application. The parent component is generically named “SideBar,” so as to allow for other content to potentially occupy the same space in the future. This component’s child is a component named “NewsPanel,” which has a series of “NewsPanelItem” components as *its* children. Since each component is responsible for creating its own UI, this hierarchical composition allows for maximum reusability and flexibility. In terms of data flow, an array of news article objects (the result of an API call) is “poured” into the top-most SideBar component, which passes down the array to its child (NewsPanel), which in turn generates a NewsPanelItem component for each of the news article objects. Thus, each component only receives the data it needs to render itself. The rest of the MyLight UI is also created in this hierarchical, composable manner that is a hallmark of the React framework.

Other frameworks used to create parts of MyLight’s UI include the Google Charts visualization library — for pie and bar charts — and Bootstrap, a CSS library used to style many of MyLight’s DOM elements such as buttons, modal windows, and text fields.

5.3. Back-End Server and API

The back-end server and API of the MyLight application are both written in Javascript using Node.js, an open-source runtime environment that is commonly used to build server-side web applications. The decision to use Node was influenced by the fact that the front-end UI was also written in Javascript (using React). Thus, using one language to write both the front- and back-ends of the

Figure 2: React component hierarchy of MyLight's sidebar, containing news articles about charities



In the news:

Chased by war, a refugee struggles to be a good father to his children
oxfamamerica.org | Dec 28, 2015

Photo: Jackie Nelson / Oxfam America "I swear on the life of my child, I don't want to live, if we have to live like this." Hassan, a father—a Palestinian refugee from Syria—said this to me as he gently placed his hand on the chest of his ...

Ethiopia afterthoughts: Did the camera turn me into just a tourist?
firstperson.oxfamamerica.org | Dec 28, 2...

Mulata Atsbeha lives in the village of Hade Alga, Ethiopia. Photo: Coco McCabe / Oxfam America I thought back to Mulata Atsbeha, the farmer and skin trader, showing us all the steps required to preserve the goat and sheep hides that help support his family.

War and 'super El Nino' expected to bring HUGE refugee influx in 2016
The Daily Express | Dec 30, 2015

Oxfam said a "super El Nino" is likely to put aid organisations

application allowed for more rapid development and more predictable debugging.

The server/API acts as an intermediary between the information contained within the database and the user interface. A number of RESTful API endpoints were created in order to shepherd data in a structured way to the UI. The two most prominent of these endpoints allowed for the creation, deletion, and updating of users and charities in the system. Since MyLight is an entirely self-contained application, these endpoints are internal to the system and are never exposed externally.

In general, after a user logs into the application, the only data that needs to be loaded into the UI include: the user's personal information (first name, last name, charitable interest preferences), the user's list of recommended charities, and the user's list of friends. These pieces of data constitute what this paper refers to as the primary "payload" of the application. This payload is compiled by the server when the user logs into the application and is re-downloaded every time the page is reloaded. Thus, when users "favorite" charities, thereby affecting their list of recommended charities, a new payload is required in order to capture the changes. However, since the payload is light-weight enough to be re-downloaded every time a user switches between pages, the user is always made aware of these changes through the UI. Thus, despite not updating the UI in "real-time," by re-downloading the payload whenever the user switches pages, the application gives the illusion of updating data in real-time.

5.4. Recommendation Framework

This sub-section describes the collaborative filtering engine that MyLight uses to generate dynamic recommendations based on a user's favorite charities. Again, these recommendations constitute the second type of recommendations mentioned in Section 3.1.

Since the task of recommending items to users based on their ratings of other items is common to modern web applications, including Amazon and Netflix, there are a number of robust recommendation engines that exist in the open source domain. MyLight uses a Node-compatible package called "recommendation Raccoon" (or "Raccoon," for short) that allows one to associate users with items (in this case, charities) and receive recommendations based on the preferences of similar users. The package uses Redis, a key-value data store, to store these associations and efficiently compute recommendations.

The framework generates recommendations based on the Jaccard Coefficient for similarity, which computes a given user X's preference similarity to all other users and recommends to user X those items that its nearest neighbors have liked that *it* has not yet liked. As the Raccoon framework explains, there are a number of other methods for calculating similarity between users and generating recommendations, but the Jaccard Coefficient excels at "measuring binary rating data (i.e. like/dislike)" [11]. This works well for the MyLight application since users are only able to "favorite" and "un-favorite" charities they are particularly interested in. The decision to stick with binary ratings ("favorite" or "no favorite"), as opposed to 5-star ratings, comes from the fact that there is little conceptual reason why a user would give a charity an average rating (2 or 3 stars).

Many companies, including YouTube, have recognized the fact that most users either strongly "like" (4-5 stars) or strongly "dislike" (1 star) items on the internet [14]. Thus, moving to a binary system allows for much greater optimization in the calculation of similarities among users, as well as the generation of recommendations.

When adopting the Raccoon framework, I initially misinterpreted its ability to allow users to "like" and "dislike" items as the ability to "like" and "un-like" items, the distinction being that the former allows for the expression of positive and negative preference, while the latter only allows for the expression of positive preference, plus the ability to *undo* this positive preference. The latter is what MyLight needed, since the goal was to allow users to be able to "favorite" and "un-favorite" charities. However, as development was underway, I noticed that the Raccoon framework's API did not allow for the ability to "un-like" items. I had only assumed that it did, mistaking the "dislike" functionality for "un-like" functionality. Thus, in order to overcome this technical roadblock, I had to fork the framework's repository on Github and implement the feature for myself. To supplement the framework's existing ability to "like" and "dislike" items, I added the ability to "un-like" and "un-dislike" items. I submitted my changes as a pull request and, as of this paper's writing, am still waiting for the developer of the framework, Guy Morita, to integrate my changes into his repository. Nevertheless, I was still able to leverage my additions in the development of MyLight's charity "favorite-ing" functionality.

After reading and understanding the framework's existing codebase, I contributed 26 lines of code across 2 files to implement the "un-like" and "un-dislike" features described above. The pending pull request containing the additions can be viewed *here*.

6. Evaluation

The process of engineering the MyLight application was consciously similar to the process of engineering a real-world application in industry. As a result, evaluation of the system was conducted in tandem with development. At the outset of development, the first two features listed in Section 3 — personalized recommendations and data visualizations — were given a higher priority than the last two features — news integration and social functionality. However, version 1 of the MyLight application, with all four core features implemented, was completed at the beginning of December. This allowed for the first round of evaluation to commence. The feedback from this evaluation was incorporated into a second iteration of development, which yielded a second version of the application. This second version was then evaluated for one final time.

This section details the three evaluation methods used throughout this process: usability testing, cognitive walkthrough, and heuristic evaluation. The first two methods were performed on version 1 of the MyLight application, while heuristic evaluation was performed on version 2 of the product.

6.1. Usability Testing (v1)

Usability testing is a user-based evaluation technique designed to "test whether the product being developed is usable by the intended user population to achieve the tasks for which it was designed" [15]. It involves observing and questioning a user as he/she attempts to complete pre-specified tasks relating to the application. Often, the subject is asked to speak aloud as he/she performs various actions, so as to gain an insight into how a typical user of the system might interpret and think about the GUI. In real-world settings, usability testing is sometimes performed in a room with video and audio recording equipment, with several observers taking notes on the subject's actions [15]. In this case, due to practical considerations, I was the sole observer of users' actions and recorded notes on paper. The pre-specified tasks that users were asked to complete were the four primary workflows described earlier in Section 4. As users attempted to complete these tasks, they articulated their thought processes, including which sub-tasks they discerned were necessary to complete each overall task, as well as any other opinions they had about the usability and/or usefulness of the application.

This form of usability testing was conducted with five separate users on version 1 of the MyLight application. Conventional thinking might assume that, the more users tested, the better, especially if the application aspires to one day be used by hundreds, if not thousands, of users. However, according to the Nielson Norman Group, a leader in user experience research, "the best results come from testing no more than 5 users and running as many small tests as you can afford" [12]. The idea is that, after the fifth user has been tested, one wastes time by "observing the same findings repeatedly but not learning much new"; in other words, there are quickly diminishing returns when testing a product with more than five users [12]. Thus, with version 1 of the MyLight application, five users were tested according to the usability testing protocol described above.

Many users shared similar insights, but there were some interesting outlying observations made as well. For example, most users intuited that indicating their charitable interests on the "Profile" page would lead to receiving charity recommendations on the "Charity List" page. However, one user went straight to the latter page, only to find zero charities listed because he had not yet indicated his charitable preferences. Some users also misinterpreted the value of "favorite-ing" charities. Most thought "favorite-ing" was simply a mechanism to bookmark or save charities they were interested in; they did not immediately recognize the relationship between "favorite-ing" charities and receiving community-based charity recommendations. One of the most interesting outlying observations was made by a user who felt that, upon logging into the application, her profile page loaded too quickly. Paradoxically, she wanted the application's loading GIF to remain on screen for just a split-second longer, so as to give the impression that the application was "setting things up" for her.

During the usability testing sessions, if users stopped talking aloud at any point due to their scrutinizing the application, I prompted them with a set of defined questions related to the specific task they were trying to complete (see Section 9.2 of the Appendix for a complete list of these questions). Furthermore, at the end of each usability session, I asked them a set of qualitative questions to gauge their overall opinions about the product. All users in the first round of usability testing reported that they thought the charity information presented within the application would be useful to them if they were thinking about donating online. They also unanimously felt that they would consider using the application in the future if it were ever officially published.

6.2. Cognitive Walkthrough (v1)

The second evaluation method used to assess the overall usability and effectiveness of version 1 of the MyLight application is a technique known as cognitive walkthrough. It involves “walking through a task with the product and noting problematic usability features” by asking three main questions which can be boiled down to the following: at any given step in accomplishing the task, (1) “will users know what to do”, (2) “see how to do it,” and (3) “understand from feedback whether the action was correct or not?” [16]. This technique is independent of users and is “an alternative approach to heuristic evaluation for predicting users’ problems without doing user testing” [16].

When performing cognitive walkthrough on the four primary workflows, or tasks, specified in Section 4, a few key observations were made that influenced the second iteration of the application’s development. After logging into the application, the user was left only to assume that indicating his charitable interests was the next step to be completed in order to obtain recommendations. As mentioned in the usability testing section, the link between filling out the profile and obtaining an initial set of recommendations was not immediately clear. However, after filling out the profile and saving changes, the system did signal to the user that his action was correct by redirecting to the charity list page. The same was true of the link between “favorite-ing” charities and obtaining community-based recommendations.

Learning about a specific charity, however, was very clear. The titles of charities on the charity list page became underlined when hovered over, indicating that clicking on a given charity would open up a page with more information. Furthermore, individual charity pages were clear in their presentation of information. Lastly, the workflow for connecting with other users was also clear due to the system’s use of standard “friend-ing” language. In other words, there were clear prompts for sending “friend requests” to other users, and it was clear when such requests were completed. In general, the cognitive walkthrough technique re-produced many of the same issues exposed by usability testing, except within the context of a structured process of inspection, as opposed to user interaction.

6.3. Heuristic Evaluation (v2)

The final evaluation method used to inspect the MyLight application was heuristic evaluation. This technique was used on version 2 of the application, after many of the usability issues mentioned above were corrected by design changes. This final technique involves inspecting various aspects of a user interface — menus, buttons, prompts, etc. — and comparing them against known heuristics, or "tried and tested" usability principles [16]. There are many commonly used heuristic sets used to evaluate applications. The set of heuristics used to inspect the MyLight application is one developed by Andy Budd, a web developer, designed specifically for websites and focusing on the following principles: (1) "Clarity," (2) "Minimize unnecessary complexity and cognitive load," (3) "Provide users with context," and (4) "Promote a pleasurable and positive user experience" [4].

The insights gained from inspecting MyLight's GUI according to these four heuristics were more holistic in nature than those gained from performing cognitive walkthrough. For example, heuristic evaluation was able to recommend changes such as making the font used to type "MyLight" consistent throughout the application, in order to provide clarity. Another insight gained from this form of evaluation was that it could be helpful to include some form of progress bar on the profile page in order to signal to the user how much of MyLight's functionality they were currently exploiting. This way, new users would be alerted to the potential of the application, while returning users would be prompted to explore new features.

Since version 2 of the application incorporated feedback from usability testing and cognitive walkthrough, heuristic evaluation was also able to validate many of these design changes. For example, including prompts that established the link between indicating charitable interests and receiving recommendations, as well as the link between "favorite-ing" charities and receiving *more* recommendations, really helped improve the overall clarity of the application. Moreover, by allowing the loading GIF to remain on-screen for a split second longer between page transitions, as one of the users in the usability testing sessions suggested, the application was able to provide more context as it transitioned from one page to another. Other changes in version 2 of the application include: making the profile page of a user's friend more closely resemble that of the user's own profile (particularly in terms of the order and style of content), adding a notifications flag in the top navigation bar in order to signal to a user when a friend has accepted a friend request, and changing the colors of some charity category tags on the charity list page in order to make them more pleasant and readable.

7. Conclusion

MyLight is a web application designed to serve as a “one stop shop” for the average philanthropist looking to donate to charities online. It recommends charities to users based on their personal charitable interests, visualizes data about them in an easy-to-understand way that inspires action, integrates current events about charities in the news, and contains social functionality to stay connected with fellow donors.

Currently, these core functionalities are all implemented in the system, but further refinement and polishing could turn MyLight into a fully robust application ready to be deployed into the world. More financial or transparency information could be incorporated into the application so as to flesh out its presentation of a charity’s overall effectiveness. Furthermore, more advanced visualization techniques could be used to allow users to control the level of detail that best suits their needs. More sophisticated recommendation algorithms could also be implemented in order to help users find the best charities that they are most passionate about. Apart from implementation improvements, more frequent and randomized usability testing could be conducted in order to gain a more well-rounded insight into the application from a user’s point of view.

Creating MyLight has been a challenging and rewarding experience with many key takeaways. By following a structured engineering and design process consisting of implementation and evaluation, I learned how to think like a real-world software engineer. I used popular technologies to create a robust web application from a single original idea, ran into technical roadblocks along the way that forced me to contribute back to the open-source community, conducted formal user testing, and incorporated user feedback into a second round of development. I also learned how to design a web application in a structured, methodical way so as to anticipate and avoid future roadblocks.

I would like to thank my advisor, Dr. Dondero, for his support, feedback, and guidance throughout the semester, as well as the users who participated in usability testing sessions. I hope to continue working on the MyLight application in the future so that, one day, it may be able to empower everyday users to donate more effectively online.

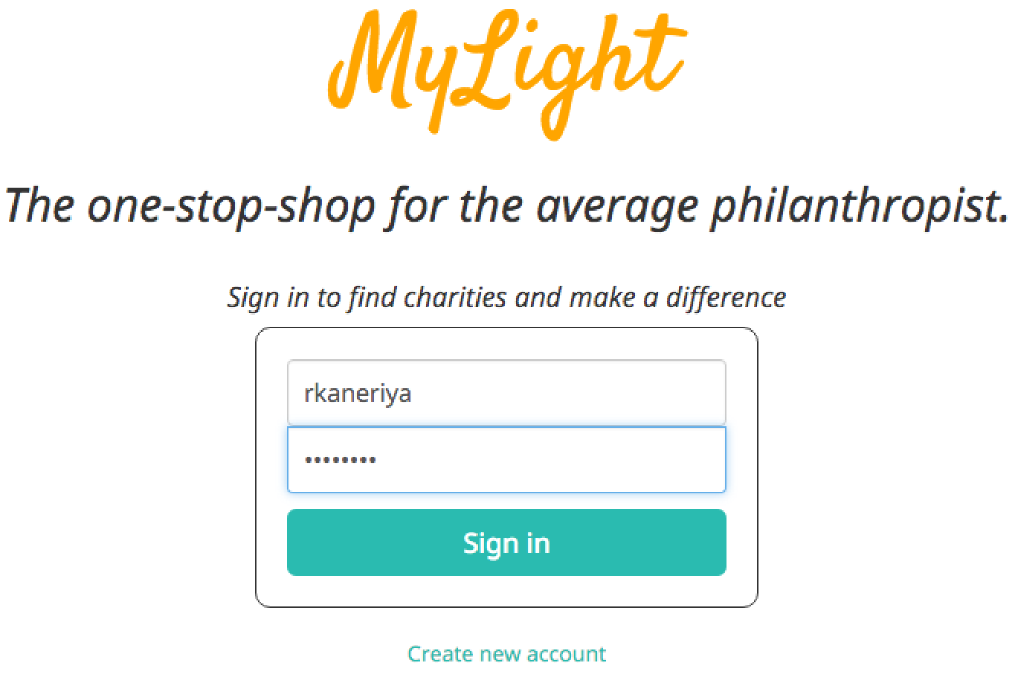
8. Honor Code

This paper represents my own work in accordance with University regulations.
x Rishi Kaneriya

9. Appendix

9.1. Screenshots of the MyLight Application

Figure 3: MyLight's default user login page



MyLight

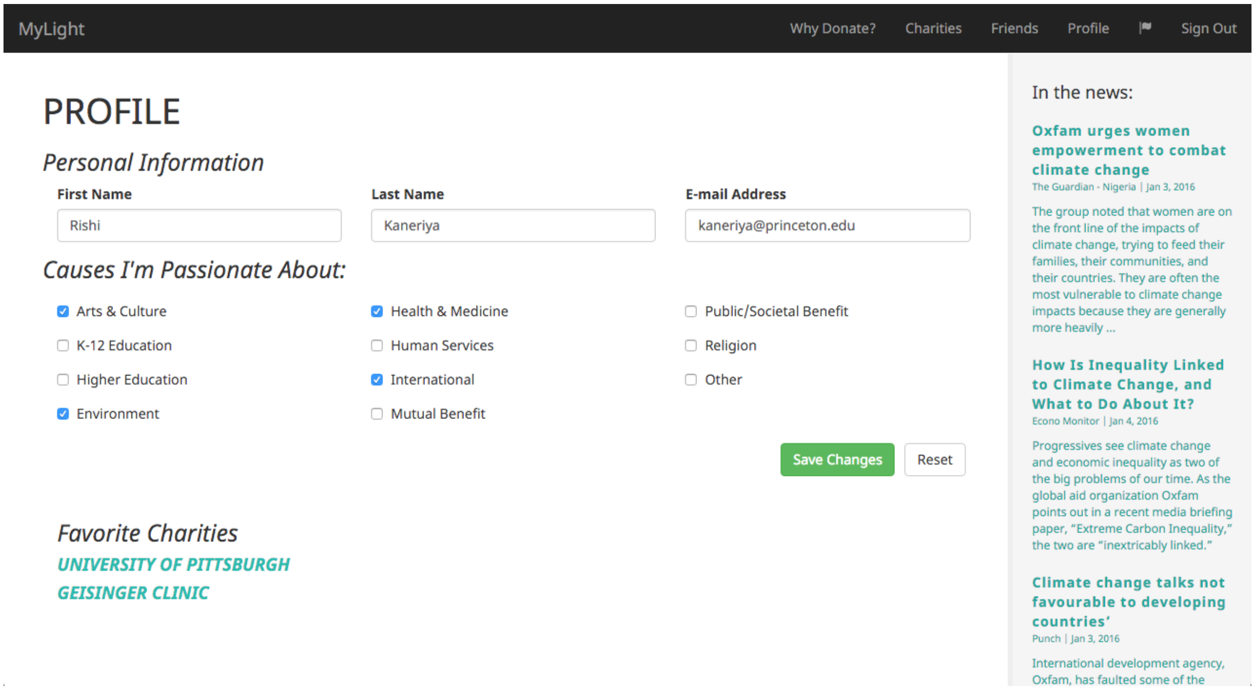
The one-stop-shop for the average philanthropist.

Sign in to find charities and make a difference

rkaneriya

••••••••

Figure 4: 'Profile' page, where users can indicate their charitable preferences



PROFILE

Personal Information

First Name	Last Name	E-mail Address
Rishi	Kaneriya	kaneriya@princeton.edu

Causes I'm Passionate About:

☑ Arts & Culture	☑ Health & Medicine	□ Public/Societal Benefit
□ K-12 Education	□ Human Services	□ Religion
□ Higher Education	☑ International	□ Other
☑ Environment	□ Mutual Benefit	

Favorite Charities

UNIVERSITY OF PITTSBURGH

GEISINGER CLINIC

In the news:

Oxfam urges women empowerment to combat climate change
The Guardian - Nigeria | Jan 3, 2016

The group noted that women are on the front line of the impacts of climate change, trying to feed their families, their communities, and their countries. They are often the most vulnerable to climate change impacts because they are generally more heavily ...

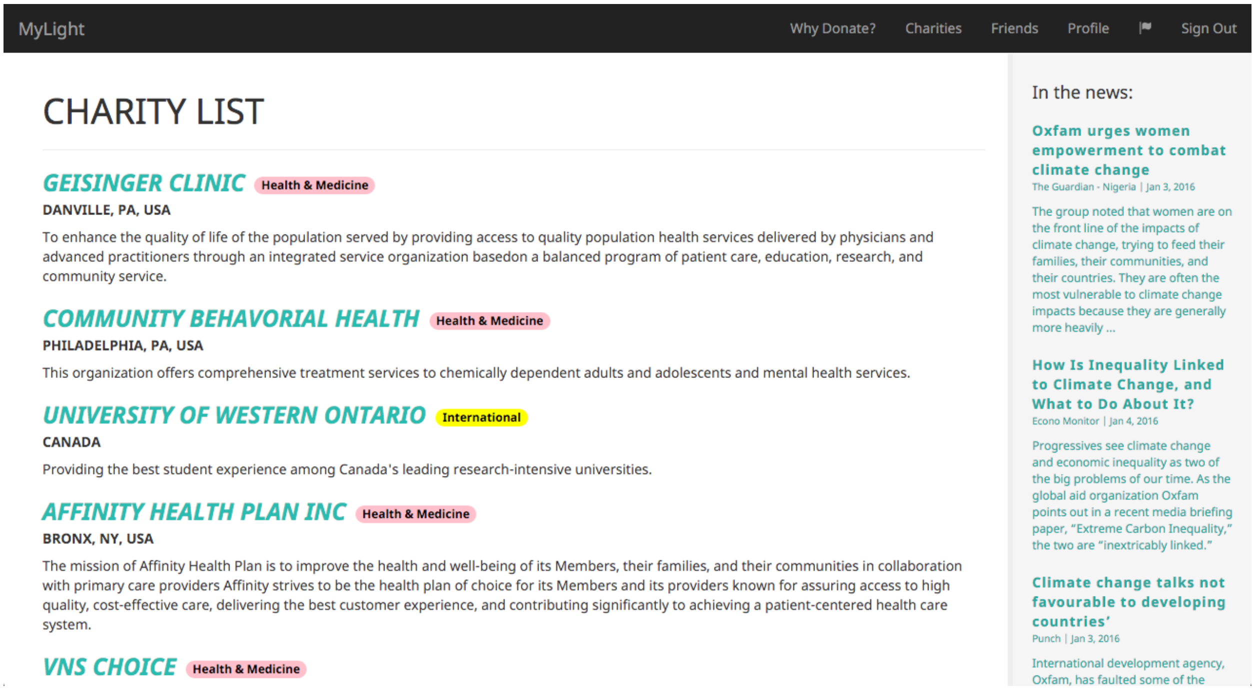
How Is Inequality Linked to Climate Change, and What to Do About It?
Econo Monitor | Jan 4, 2016

Progressives see climate change and economic inequality as two of the big problems of our time. As the global aid organization Oxfam points out in a recent media briefing paper, "Extreme Carbon Inequality," the two are "inextricably linked."

Climate change talks not favourable to developing countries'
Punch | Jan 3, 2016

International development agency, Oxfam, has faulted some of the

Figure 5: 'Charity List' page displaying recommended charities



CHARITY LIST

GEISINGER CLINIC Health & Medicine
DANVILLE, PA, USA

To enhance the quality of life of the population served by providing access to quality population health services delivered by physicians and advanced practitioners through an integrated service organization basedon a balanced program of patient care, education, research, and community service.

COMMUNITY BEHAVORIAL HEALTH Health & Medicine
PHILADELPHIA, PA, USA

This organization offers comprehensive treatment services to chemically dependent adults and adolescents and mental health services.

UNIVERSITY OF WESTERN ONTARIO International
CANADA

Providing the best student experience among Canada's leading research-intensive universities.

AFFINITY HEALTH PLAN INC Health & Medicine
BRONX, NY, USA

The mission of Affinity Health Plan is to improve the health and well-being of its Members, their families, and their communities in collaboration with primary care providers Affinity strives to be the health plan of choice for its Members and its providers known for assuring access to high quality, cost-effective care, delivering the best customer experience, and contributing significantly to achieving a patient-centered health care system.

VNS CHOICE Health & Medicine

In the news:

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Punch | Jan 3, 2016

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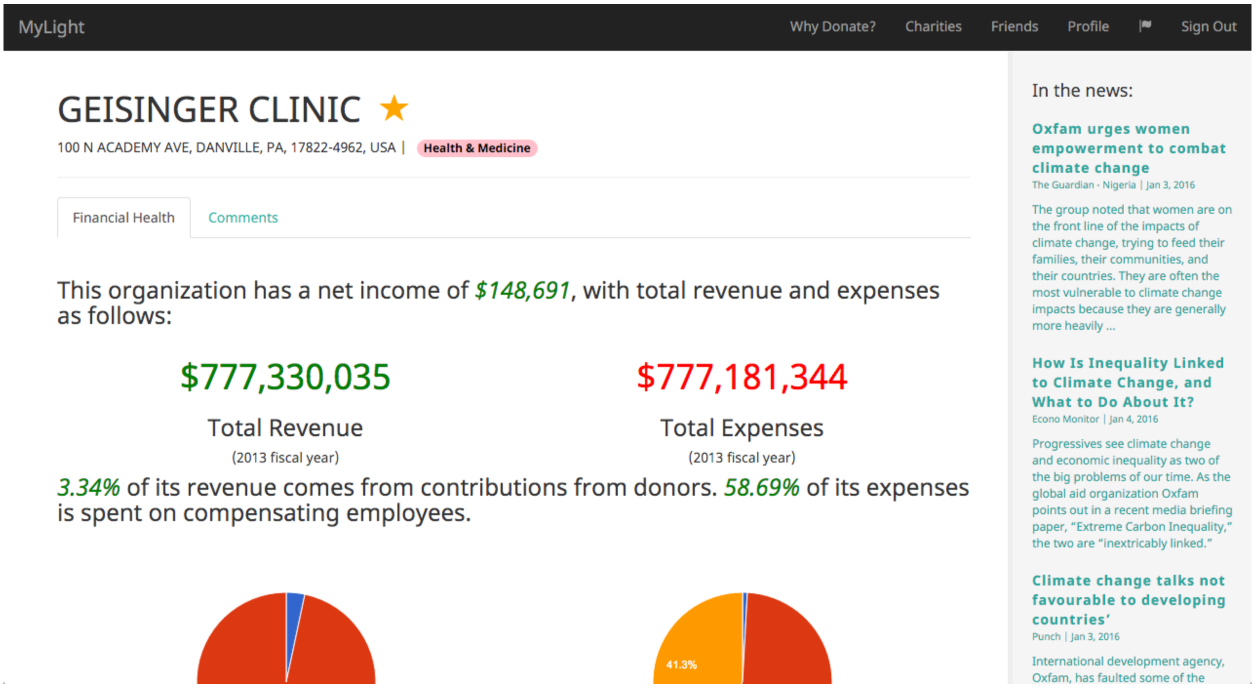
Figure 6: ‘Charity Page’ displaying financial information about a specific charity (1)



GEISINGER CLINIC ★

100 N ACADEMY AVE, DANVILLE, PA, 17822-4962, USA | Health & Medicine

This organization has a net income of *$148,691*, with total revenue and expenses as follows:

$777,330,035

Total Revenue

(2013 fiscal year)

$777,181,344

Total Expenses

(2013 fiscal year)

3.34% of its revenue comes from contributions from donors. *58.69%* of its expenses is spent on compensating employees.

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Oxfam urges women empowerment to combat climate change

The Guardian - Nigeria | Jan 3, 2016

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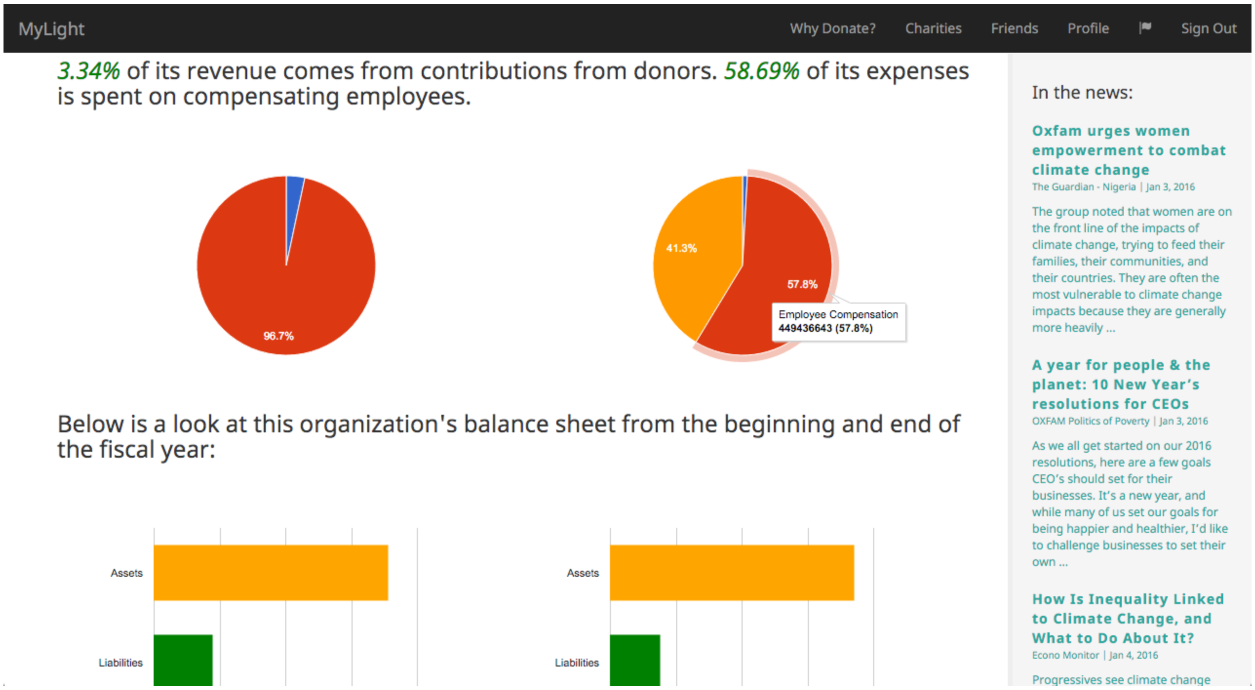
Climate change talks not favourable to developing countries’

Punch | Jan 3, 2016

International development agency, Oxfam, has faulted some of the

Figure 7: ‘Charity Page’ displaying financial information about a specific charity (2)



3.34% of its revenue comes from contributions from donors. *58.69%* of its expenses is spent on compensating employees.

Below is a look at this organization's balance sheet from the beginning and end of the fiscal year:

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The Guardian - Nigeria | Jan 3, 2016

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A year for people & the planet: 10 New Year’s resolutions for CEOs

OXFAM Politics of Poverty | Jan 3, 2016

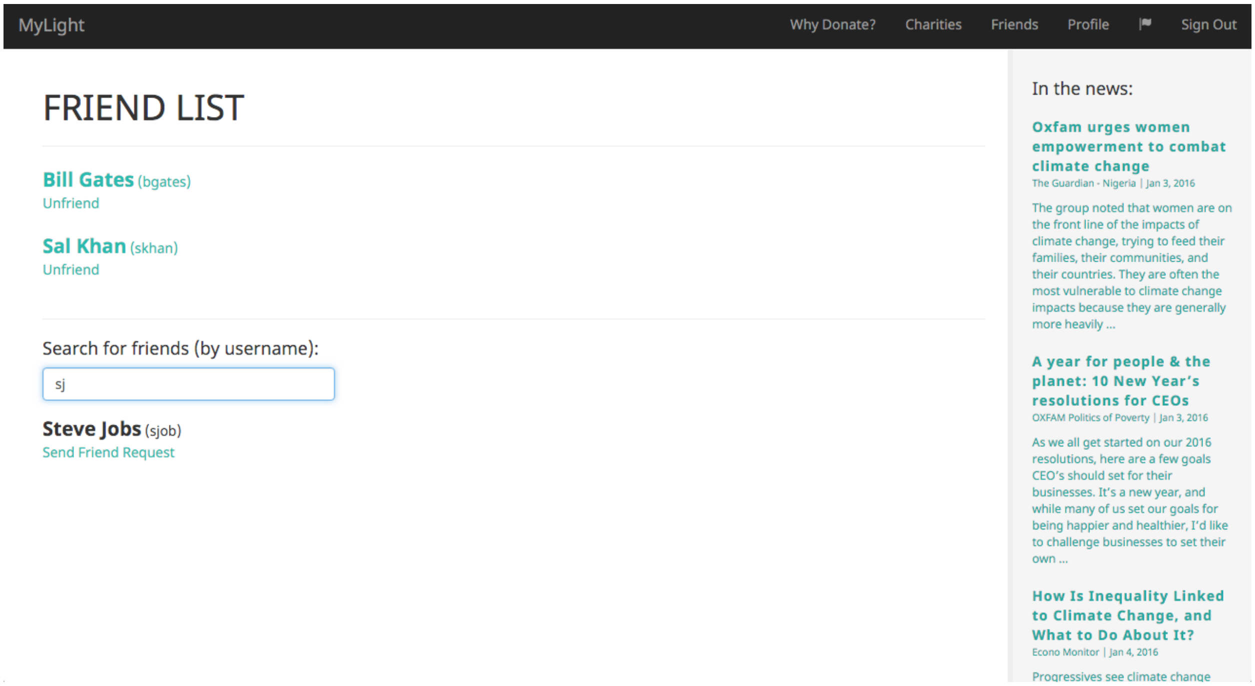
As we all get started on our 2016 resolutions, here are a few goals CEO’s should set for their businesses. It’s a new year, and while many of us set our goals for being happier and healthier, I’d like to challenge businesses to set their own ...

How Is Inequality Linked to Climate Change, and What to Do About It?

Econo Monitor | Jan 4, 2016

Progressives see climate change

Figure 8: ‘Friends List’ page displaying a user’s friends



FRIEND LIST

Bill Gates (bgates)
Unfriend

Sal Khan (skhan)
Unfriend

Search for friends (by username):

sj

Steve Jobs (sjob)
Send Friend Request

In the news:

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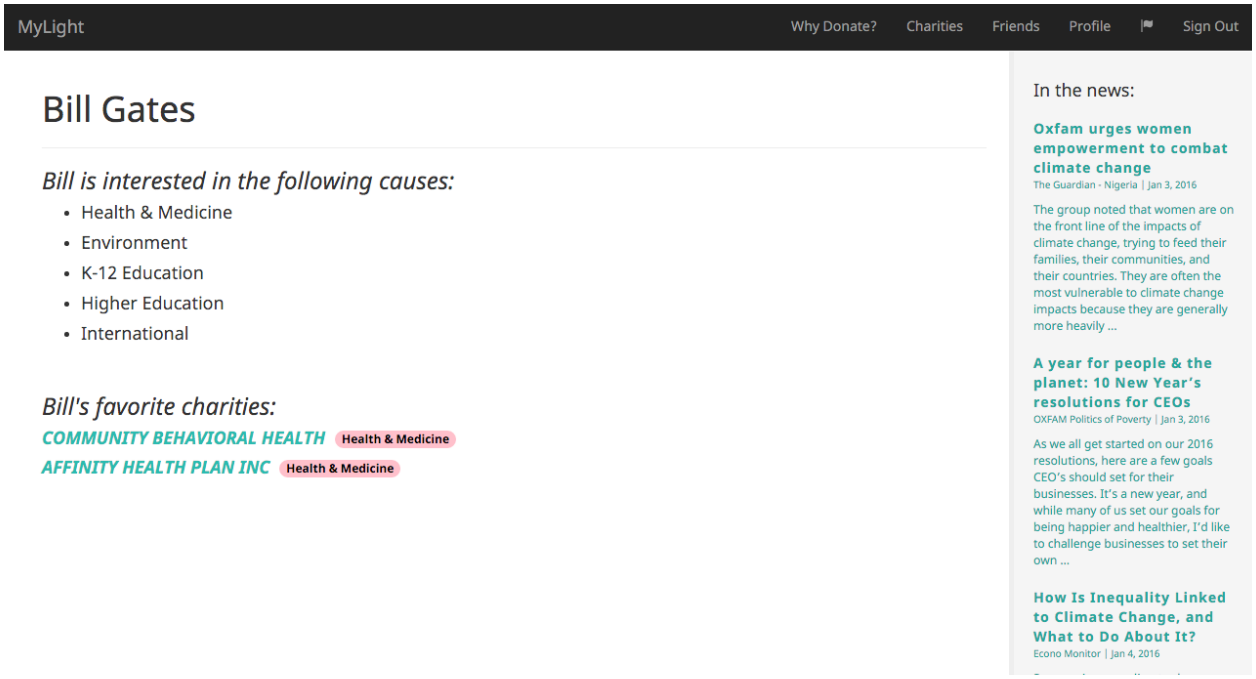
Econo Monitor | Jan 4, 2016

Progressives see climate change

Figure 9: ‘Friend’ page displaying the interests and favorite charities of a user’s friend



Bill Gates

Bill is interested in the following causes:

- Health & Medicine
- Environment
- K-12 Education
- Higher Education
- International

Bill's favorite charities:

COMMUNITY BEHAVIORAL HEALTH Health & Medicine
AFFINITY HEALTH PLAN INC Health & Medicine

In the news:

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9.2. Usability Testing Questions

Workflow 1:

- What are your thoughts on the layout of the Profile page?
- What do you think clicking on the “Save Changes” button will do?
- Where do you think a list of recommended charities is located?

Workflow 2:

- What kind of information is presented on this page?
- What do you think clicking on the star next to the charity’s name will do?
- Is there anything you were expecting to see on this page that you didn’t?

Workflow 3:

- Did you notice that the list of recommended charities on the Charity List page changed as a result of your “favorite-ing” organizations?
- What order do you think the charities are presented are in?

Workflow 4:

- How do you think you can add new friends?
- What kind of information do you expect to see when clicking on a friend’s name on the Friends List page?

Holistic Questions:

- Did you think the charity information presented in the application would be useful to you if were thinking about donating online?
- Would you consider using this application in the future if it were published?

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