Addressing Non-Profit Impact Communication

A Case Study with Caras con Causa

caras con causa

by
Alexander Breiling
John Higgins
John Puksta
Darian Tavana

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by
Alexander Breiling
John Higgins
John Puksta
Darian Tavana

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Michael Fernández Frey
Caras con Causa

Professors Brigitte Servatius and Alex Sphar
Worcester Polytechnic Institute

Abstract

Non Profit Organizations (NPOs) struggle to utilize their data to demonstrate their organizational effectiveness. NPOs collect data but struggle to extract information from the collected data because of a limited use of technology and lack of technical expertise. This IQP aims to address this societal problem by researching, developing, and implementing data visualizations that demonstrate a NPOs progress. An iterative design process was conducted with Caras con Causa to determine technology to use, visualizations, necessary changes in data practices, and what metrics to display. Through this process, a dashboard solution using Google Data Studio was refined to display key metrics for Caras con Causa's LabCom Program.

Executive Summary

Introduction

Many NPOs struggle to utilize the data that they collect. Effectively communicating data to the public allows organizations to inform stakeholders, improve community awareness, better community engagement, and to attract volunteers (*Dutta*, 2020). Effective data communication internally can help a nonprofit evaluate its successes, failures, and where it needs to dedicate its resources to improve its operations in the future (Fruchterman, 2016). The focus of this project is to research methods to improve data utilization for NPOs. Our plan to achieve this is to evaluate data visualization methods from other NPOs and define key metrics with our sponsor to construct an effective solution to communicate their data. Caras con Causa, the sponsor of this project, is a NPO that would like to improve the way that they utilize their data.

Background

NPOs face a broad societal problem when it comes to communicating their success metrics to various audiences. NPOs are heavily reliant on public perception and advertising to receive funding. However, this is not easy for NPOs to achieve because of their lack of technical expertise and small budget. We discuss the issues NPOs commonly have with data utilization, the importance of data in nonprofit funding, how other nonprofits visualize their data, and a basic description of Caras con Causa, the sponsor of this project.

Research Methods

The focus of this project is to develop a set of interactive dashboards to help Caras con Causa visualize their data more effectively. Google Data Studio was selected as the platform of choice for the project. This is primarily because of its ease of connection to Google Sheets, the platform that Caras uses to store all of their data. We focused on the creation of a dashboard for Caras con Causa's LabCom project, a science education program.

Dashboard Creation

We go over each prototype of the dashboard created for LabCom, its main features, and the issues that we encountered in the process, highlighting the iterative design process involved in the creation of the final product. We also created a general lookup dashboard to track the contributions of individuals across the whole organization.

Recommendations and Conclusion

Caras con Causa is missing a lot of contact information for their participants. We recommend that this be corrected if possible in order to ensure more accurate reporting.

We also recommend a general improvement of data practices including standardizing all Google Forms used to collect data, building upon our dynamic forms prototype, condensing the amount of data sources for each program, and moving away from manual data collection.

Our third and final recommendation is to adapt our LabCom prototype to other programs. This process will be much more streamlined once data practices have been improved throughout the organization.

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Chapter I: Introduction

Non-profit organizations (NPOs) operate by providing services that strive towards shared civil, economic, social, and cultural goal(s) while not obtaining profits (Ciucescu, 2009). Because NPOs do not generate profit, these organizations are often unable to provide the competitive wages or benefit packages that many FPOs can provide (Slatten et al., 2021). As a result, NPOs attract people who resonate with the organization's beliefs instead of technically diverse, profit-driven employees.

The results of this challenge is that many NPOs struggle to utilize and effectively communicate the data that they collect. Effectively communicating data to the public allows organizations to inform stakeholders, improve community awareness, better community engagement, and to attract volunteers (*Dutta*, 2020). Effective internal data communication can help a nonprofit evaluate its successes, failures, and where it needs to dedicate its resources to improve its operations in the future (Fruchterman, 2016). The focus of this project is to research methods to improve data utilization for NPOs and use this knowledge to better communicate their impacts. Our plan to achieve this is to evaluate data visualization methods from other NPOs and define key metrics with our sponsor to construct an effective solution to communicate their data.

Caras con Causa, the sponsor of this project, is a NPO that would like to improve the way that they utilize their data. Caras con Causa's mission is to eliminate poverty in the Cataño and Guaynabo communities of Puerto Rico. They make progress toward this goal by leading projects in four target areas: ecology, economy, education and community. For each of their projects, they collect data to illustrate progress toward goal completion and their broader mission, but they have been unable to effectively communicate that data, both within the organization and to external stakeholders. Throughout the course of this project, Caras con Causa will serve as a case study for how an organization can employ data visualization techniques in order to improve its internal outcomes and stakeholder communication.

Cultural Experience

Our first interactive experience occurred during our initial in-person meeting with our sponsor. In this meeting, we presented our research, explored solutions, future plans, and unanswered questions. These discussions allowed us to define key aspects of our project. Furthermore, we have experienced Caras con Causa's work environment by working in their office space two to three times a week.

Figure 1: Urban Roots Reforestation Photo 1

We attended the creation of a microforest hosted by the organization's Urban Roots program. There were around one-hundred volunteers and participants including local high schoolers, Puerto Rican residents, alternative spring-breakers, and ourselves. We learned that the reforestation site contained the remains of demolished houses such as concrete chunks. Therefore, we needed to spread additional fertilizer around the planted trees to ensure their growth. While we worked, we conversed with another group called the AmeriCorps National Civilian Community Corps (NCCC), who had been helping Caras con Causa with the reforestation. We are extremely thankful for this experience and because of it were able to better understand the way Caras con Causa contributes to the community.

Figure 2: Urban Roots Reforestation Photo 2

Through the planting experience we also learned first hand how Caras con Causa collects data. We were handed paper forms and told to fill in our names and the time that we began working. Those papers were then used to input the data into a Google Form after the event. Notably, data collection is fully manual, meaning that the data entry can lag behind what the

organization has done. Another issue with their system is that there is no effective way to determine the end time of their volunteers/participants so any hours are approximate.

In addition to working with the organization, we were able to experience historical tourism in Old San Juan, the ocean at the Condado and Escambrón beaches, and night-life in La Placita and Old San Juan. We had to take Ubers multiple times a week, which allowed us to communicate with the local Puerto Rican residents and learn more about the island and practice our Spanish. Generally, we felt like we engaged with the culture, citizens, and lifestyle of Puerto Rico.

Chapter II: Background

NPOs face a broad societal problem when it comes to communicating their success metrics to various audiences. NPOs are heavily reliant on public perception and marketing to receive funding. However, this is not easy for NPOs to achieve because of their lack of technical expertise and small budget. The following chapter discusses the different aspects of this societal problem through a discussion of how and why NPOs maintain donors through their marketing and how NPOs lack necessities to utilize data and the consequent problems that arise.

Nonprofit Data Utilization

A 2011 study by DonorVoice asked 250 nonprofits with good donor retention rates about their data practices. The number one reason donors were retained was because the donor perceived the organization as effective (Shattuck, 2019). For example, displaying the NPO's yearly growth means that the impact of an organization can be quantified, which increases the probability of keeping donors and gaining new ones. The same is true of other non-donor stakeholders. If an NPO has effective data communication, it will be able to better define its vision and demonstrate its importance to its stakeholders.

Many NPOs collect data relating to their organization's success but few utilize this data to its fullest extent (*EveryAction*, 2018). As a result, they are less able to communicate their efforts and impact, and are not making full use of their resources. In a survey conducted in 2018 by *EveryAction*, 460 NPOs were asked about their current understanding of how data in their organizations was used. Out of these 460 organizations, 90% of them recorded that they were collecting data, but almost half responded that they did not understand how their data could positively impact their organization (*EveryAction*, 2018). Additionally, one of the main reasons why NPOs fail is because they have poor record keeping of their data, lack technical leadership, and lack plans for use of their data (Ebarb, 2019). Overall, it is clear that NPOs struggle to communicate their impact because they do not know what data to collect and if they have data

what they can do with it. These issues can have a major impact on the amount of funding that an NPO can receive.

The study by *EveryAction* also elaborated on why NPOs are struggling to utilize their data. The first factor that was enumerated in this study was not having the time or personnel to focus on data usage. Almost 80 percent of the NPOs in this study reported that they did not have enough resources to focus on how their data is being used (*EveryAction*, 2018). This stems from NPOs putting the majority of their resources into achieving their mission, often neglecting other business aspects such as acquiring individuals with technical expertise. The second leading factor was found to be the lack of staffing personnel that have data management experience. In the survey, 55 percent of participants indicated that they did not have a designated staff member for data management. The third leading factor identified in the survey is a lack of data centralization. Forty-six percent of NPOs surveyed reported that their data was scattered across multiple locations (*EveryAction*, 2018). Without a central location for storing data, it becomes difficult to utilize in an effective manner. These three issues described can be broken down into four subcategories as described in *Table 1.* To begin utilizing their data effectively, NPOs must consider the following components.

Table 1: Breakdown of NPO Issues and Factors Involved

Issue	**Factors Involved**
Data Collection	● Might not be collecting the right data ● Data collection is often manual, feeds into a variety of sources and results in decentralized data storage
Data Storage	● Scattered data, lack of centralization ● Need to relate similar types of data but lack resources to do so
Data Usage	● Insufficient personnel, resources, and time to focus on data ● Don't know how to effectively use data for public awareness/growth evaluations ● Difficulties retrieving data from decentralized databases
Data Visualization	● Lack of employees with technical experience. ● Lack of data centralization ● Defining audience

Adapted From Shattuck, 2019, *EveryAction*, 2018, Ebarb, 2019

The Importance of Data in Nonprofit Fundraising

Traditionally NPOs receive funding through one or more of the numerous funding models available. There are a variety of sources of nonprofit funding including individual donors, grants, and corporate sponsorships, with individual donors making the largest overall contribution to the nonprofit sector (Ibrisevic, 2020).

One common funding model is the Public Provider model, in which the government provides funding in exchange for the NPO providing essential social services (housing, education, etc) regulated by government standards (Foster et al, 2009). As long as the NPO meets the requirements set by the funding government, they will continue to receive funding. Alternatively, NPOs can receive government funding through a Policy Innovator model. This model is based on the NPO developing methods that solve social issues that other NPOs fail at. The NPO convinces the government that they can address the issue better, demonstrating their need for funding (Foster et al, 2009). Thus, for NPOs to receive government funding they must either uphold the government's standards or convince them that they can provide a unique and effective solution to a social problem. In order to demonstrate either of these characteristics, nonprofits must be able to demonstrate concrete impact, which can be accomplished through data. Furthermore, any government funding requires accurate reporting on federal compliance, financial data, and information about a funded project's impact (grants.gov, n.d.). Not only is data essential to convincing the government to provide grants, accurate reporting of grant usage is required by United States law.

Volunteer recruiting can also contribute great value to an NPO. According to the National Philanthropic Trust, in 2017 volunteers in the United States contributed an estimated 195 billion USD in value through free labor (National Philanthropic Trust, 2022). The Heartfelt Connector funding model revolves around developing strong personal relationships between people and the environment, medical research, shared beliefs, and interests. This model encourages a wide range of volunteers and donors at all income levels to become donors, targeting the individual donor (Foster et al, 2009).

Project Focus

Our project focuses on Caras con Causa, a NPO located in Puerto Rico that wants to improve their communication of their impact. The organization has identified various issues with how they collect and visualize their data. Since 2020, the organization has grown quickly. As a result, much of their effort has been focused on the work they are doing for the public rather than optimizing their internal operations. Secondly, Caras con Causa stores their data in a variety of locations, which makes it hard to consolidate and visualize. Furthermore, a large majority of this data is collected manually by employees. The focus of this project is to help Caras con Causa visualize their existing data by constructing an internal dashboard for each of the projects that they manage. This will help them identify growth between years, patterns in

the work that they perform, and more quickly access information necessary for grants and appealing to donor organizations.

Analyzing Nonprofit Dashboards

Nonprofit dashboards are a common tool for communicating project statistics and can be found on a variety of nonprofit websites. Six nonprofit websites with nonprofit dashboards were reviewed to find the commonalities between them and to determine what makes them successful (The American Red Cross, Arizona Humane Society, PRXPR, Helen Keller International, SCI Foundation, and GiveDirectly). All of these dashboards are simplistic in design and communicate only a few statistics. Selecting which statistics are the most important for an organization to communicate is critical. In the case of Red Cross wildfire relief, this includes meals served, distribution of relief items, and other related categories. For Helen Keller International, data includes medication delivered and countries they operate in. Depending upon the organization's goals and mission the types of data that they display will vary greatly. Of the reviewed dashboards, 5 out of the 6 sites supplemented the data with infographics or images to better draw the user's attention and illustrate the story that the data tells. One dashboard that particularly stood out was the prxpr.org dashboard, which has a large image of the organization at work in the background alongside 4 meaningful and eye-catching statistics (Figure *3*). One major issue with the dashboard in Figure *3* is that the numbers don't have any attached value or story. While impressive, they do not appeal to emotion nor demonstrate the need behind each of their statistics. According to Statistical Persuasion, statistics are best presented after they are transformed into analogies or scales that individuals can relate to, and that raw numbers without an attached message are not as persuasive (Pearson, 2010). Consequently, the meaning behind the statistics is lost in communication.

Figure 3: PRXPR Data Dashboard (PRXPR)

Caras con Causa wants to improve their ability to communicate the impact of their programs to their stakeholders, including donors, volunteers, other organizations, and the communities that they serve. They also wish to improve their organizational transparency to these same groups. While data visualization is important, it is far from the only means of communicating nonprofit impact. One highly effective and commonly used method is storytelling. In a study performed by Network for Good, 82% of 400 surveyed NPOs indicated that they use storytelling in funding reports. Fifty-six percent of those that did reported that storytelling improved their outcomes (Network for Good, n.d.). Creating an emotional connection between data, a nonprofit's mission, and their actions increases potential stakeholders' investments in NPOs. The same survey indicated that storytelling alone is not enough to get donors to buy in and must also be supplemented with data (Network for Good, n.d). These statistics highlight the importance of combining data-driven solutions and qualitative methods such as storytelling.

While donors are an important group to consider, they are one among many potential supporters of the organization including volunteers, partner organizations, and the communities that an NPO serves. Visual methods have been shown to be highly effective for all kinds of communication, so these groups will also be effectively targeted by visual storytelling. Over 90% of the information processed by the brain on a daily basis is visual, and people remember visuals much better than written words (Manic, n.d.), making visual communication a highly efficient way to create and maintain interest. In a study performed by the University of Minnesota School of Management, it was demonstrated that visual advertisements are 43% more effective than text-based methods at convincing an audience to make a certain decision (Manic, n.d.). This illustrates the importance of visual communication and its greater effectiveness compared to text-based approaches. Video is also highly successful in creating user engagement and conveying a message. According to a survey on Facebook marketers, 60% of the surveyed participants stated that videos create more customer engagement, as measured by ad clicks (Dopson, 2021). A literature review in the Journal of Nonprofit & Public Sector marketing also identified video communication as highly effective for developing the identity of a nonprofit organization (Waters and Jones, 2011). All of these factors point towards visual communication as one of the most effective tools for creating engagement and telling a story.

Testimonials and personal stories are another means of communicating nonprofit impact. Creating relatable stories can increase engagement with the community and help persuade stakeholders by directly appealing to emotion. Testimonials are commonly used by other NPOs including The American Red Cross, PRXPR, Habitat for Humanity, Helen Keller International, and the SCI Foundation. By supplementing data with stories, a connection is made between the numbers and the real world impact.

Dashboard solutions

Tableau

Tableau is one of the most prominent dashboard solutions used in industry. As a service, Tableau has the ability to provide “insights into dynamics, trends, and other important business data'' (*Tableau vs. Google Data Studio: Which is Better?, 2022*). Furthermore, the service allows easy integration with a variety of different data sources. Once multiple data sources have been linked, Tableau offers the ability to blend data from multiple sources into a single visualization (*Tableau vs. Google Data Studio: Which is Better?, 2022*). By doing so, Caras con Causa could easily gain insight into data across all of their different projects. Although Tableau seems like a strong candidate for this project, there are a couple disadvantages to the service. For one, Tableau is not a free service. Given NPOs' low budgets, this could be a problem. Additionally Tableau’s integration with Google products is limited (Sergio, 2021). Given that Caras con Causa primarily uses Google services to store their data this is also an issue.

Google Data Studio

A critical requirement Caras con Causa has for our dashboard is that it needs to easily integrate with Google services. At the moment they heavily rely on Google Forms and Google Sheets for data collection. One possible solution to create such a dashboard is Google Data Studio. This is a free platform that provides the ability to build a dashboard that can display key metrics for Caras con Causa (Whale, 2022). Google Data Studio is entirely a cloud based service, which means there is no underlying infrastructure that needs to be maintained by us. The platform also provides easily editable widgets that have a variety of display options that display data in realtime. These options also have the ability to restrict privacy based on the viewers, which would be especially useful if Caras con Causa would like to maintain external dashboards. Overall, Google Data Studio provides a solid platform that is easy to use/integrate, free, and maintainable (Hevo, 2022).

Information about our Sponsor: Caras con Causa

Overview of the Organization

Caras con Causa was founded in 2004 at George Washington University by a group of students. The organization would recruit volunteers on and off campus to raise funds for

service-learning programs that impacted communities in Guatemala, Haiti, Peru, Costa Rica, and Honduras (Mercier, 2020). In 2007, the organization relocated to Puerto Rico when one of their founding members and leader, Michael Fernandez-Frey, moved there for a teaching opportunity (Rotermund, 2019). Through the experiences and connections he made teaching, he helped Caras con Causa establish its first ever program, which was after-school tutoring in the Vietnam Neighborhood in Guaynabo (Rotermund, 2019). By 2012, Caras was able to keep full-time staff members and was recruiting hundreds of volunteers, who in that year completed over 4,500 hours of service (Rotermund, 2019). In 2012 and the following few years, the organization faced their first community wide problem. San Juan's mayor at the time, Hector O'Neill, planned to expropriate waterfront land within Vietnam. In its place, the mayor planned to build a multimillion-dollar tourist complex. The people that owned homes in the area that was set to be demolished were outraged, and with the help of Caras they were able to fight back to end demolitions (Mercier, 2020). Today, Caras con Causa has focused their mission toward eliminating poverty in the Cataño and Guaynabo communities of Puerto Rico. They do so by leading projects that address societal challenges in four major areas: ecology, education, economy and community.

Figure 4: Catano and Guaynabo, Adapted from Hachette Book Group

Ecology

Caras con Causa has three central projects within Ecology, Raíces Urbanas, Vivero Antillano and LabCom that all aim to tackle ecological problems in the community and in La Reserva Natural Ciénaga Las Cucharillas (RNCC), a local nature reserve. To accomplish this, resources are shared between the three projects.

LabCom is a world class laboratory that investigates environmental conditions. Currently LabCom is working on multiple projects: monitoring litter and water quality in nearby bodies of water, estimating biodiversity in the RNCC, monitoring flooding and urban microclimates, and monitoring crops in the RNCC and neighboring communities. Each of these projects combines professional research with two community-driven citizen science platforms, Anecdata and iNaturalist.

To understand what Anecdata and iNatualist do first let us first define citizen science. Citizen science is defined by the EPA as the use of community members “to identify research questions, collect and analyze data, interpret results, make new discoveries, and develop technologies and applications – all to understand and solve environmental problems” (US EPA, 2019). Anecdata is one implementation of this framework which lets users enter categorical, quantitative, or qualitative data for a research project. iNaturalist takes a different approach than Anecdata, it stores images taken by users and organizes them based on location and species, which can be useful in estimating biodiversity in an area (U.S. EPA, 2002).

With the data collected between these projects, LabCom guides conservation work for both Vivero Antillano and Raíces Urbanas. Vivero Antillano is a greenhouse that produces native, endemic and endangered plants. The plants grown there provide learning opportunities for students and opportunities for scientific research. Raíces Urbanas takes the plants grown in Vivero Antillano and transplants them into Las Cucharilla with the goal of reforestation. Raíces Urbanas has also built pollinating gardens and small forests within the community to better the environment. This is extremely important, especially after Hurricane Maria, because many shrubs provide valuable ecosystem services that help the environment recover. Specifically, recovering the mangrove population is extremely valuable as mangroves provide a protective wall against future hurricanes due to their enormous biomass (Hernández et al., 2021).

Economy

Caras con Causa works to better the economy in their target communities through three projects: Trabajo por mi Comunidad, Encuentros Comunitarios, and Programa de Voluntariado Virtual. Trabajo por mi Comunidad provides summer internships for young people by placing them on community development projects. Encuentro Comunitarios is a community-run tourism project, providing ecological and cultural tours to visitors for a price. All proceeds from this project are reinvested back into the communities Caras con Causa serves. Programa de Voluntariado Virtual coordinates with other institutions/organizations that share Caras con Causa’s mission. As of this writing, they have successfully coordinated 12 events contributing to planning new sources of income, forming a literature review database, a data management implementation plan, and the creation of a rainwater harvesting system.

Education

Caras con Causa does a tremendous amount for their target communities to enhance children's education within the community. Firstly, they run two K-6 after school projects: Vietnam Estudia and Puente Blanco Educa. Each of these provide tutoring, snacks and various other activities for students after school hours.

Trayecto Universitario is another one of Caras educational projects. The program aims to help community members gain access to a college education. Academic support, workshops, guidance on the application and examination process, and individualized and/or group interviews with a counselor are offered as a part of the program.

Finally Caras' largest project to date is their free grade 6-12 non-sectarian public school, Escuela con Causa. Escuela con Causa is their own entity with a separate website and mission. Currently the school serves over 350 students in the Cataño and Guaynabo communities. The organization provides a STEAM education, which is "an approach to learning that uses Science, Technology, Engineering, the Arts and Mathematics as access points for guiding student inquiry, dialogue, and critical thinking" (Riley, 2022).

Community

Caras con Causa does not view themselves as a service provider for the community but rather as a partner to help implement the communities vision. As an organization they regularly try to collaborate with the community to coordinate their projects. Additionally as needs arise, the organization steps in to assist the community. For example, in response to COVID-19, they developed a food and personal protective equipment distribution project to help keep the community safe. This project expanded once public vaccinations began to be a collaborative effort with the Voces Organization and the Bayamón Community Health Foundation to offer elderly residents transportation to vaccination centers that otherwise had no transportation to do so.

Geographical Information and its Relevance to Caras con Causa

Puerto Rico has a very high poverty rate, as displayed by annual statistics collected by the U.S. Census Bureau (UCB). Based on the census from 2020, Puerto Rico has a population of over 3.2 million people, and roughly 1.4 million of these people (43.5%) have been defined as living in poverty (US Census Bureau, 2020). In Cataño there is a population of 23,155, and 11,253 (48.6%) of these people are in poverty. Although Guaynabo is in a much better place with a population of 89,780 people with only 22,714 people (25.3%) in poverty; the number of people in poverty here is still roughly double the amount of people in poverty living in Cataño (US Census Bureau, 2020).

Throughout its history, Puerto Rico has struggled. The island has been through an extremely challenging past few years facing an enormous debt crisis since 2016, experiencing natural disasters (Hurricanes Irma and Maria in 2017, earthquakes in 2020) and dealing with COVID-19 (Center For Puerto Rican Studies, 2021). Not only have these events caused deaths

within the population, they have triggered an exodus of people from Puerto Rico (Intersimone, 2021). The situation they are in right now is a seemingly never ending loop of despair, because oftentimes when individuals grow up in poverty they struggle to escape (Mayol-García, 2020). This in turn leads to a less successful generation, which ultimately prevents infrastructure from advancing, continuing to feed this regressive feedback loop (Perreira et al., n.d.). This all encompassing and difficult problem is the one Caras and other NPOs within Puerto Rico wish to tackle.

Tracking Nonprofit Success

The success of nonprofit organizations is tremendously important to the growth of areas such as Puerto Rico that have struggled so much. However determining if a nonprofit organization is successful through data is often a difficult problem. Conversely, in typical profitable business there is often greater clarity in organizational success metrics. This is because of the wide variety of business models that serve as a lens in which we can measure their success (Foster et al, 2009). A few metrics these frameworks use include an upward trending stock price, a rise in employee satisfaction, increased revenue or other such positive growth measures. While many of these can be applied to NPOs, they are not necessarily what defines the organizations success.

Instead, for NPOs their main priority is to make progress toward achieving their mission. However, NPOs' mission statements are often broad, all encompassing statements. Take for example the American Museum of Natural History who defines their mission as "To discover, interpret, and disseminate—through scientific research and education—knowledge about human cultures, the natural world, and the universe." (McKinsey, n.d). Such a goal is almost impossible to directly quantify. Many organizations like this get stuck in the weeds measuring something that is parallel to their mission but not quite the same. A further example is the Natural Conservancy, whose mission is "to preserve the diversity of plants and animals by protecting the habitats of rare species around the world". For the majority of the organization's lifetime, their pitch to investors was the dependence between the number of acres owned to the amount of funding they received. On the surface this is simple for donors to understand; however, under further inspection endangered species in these areas were still trending toward extinction (McKinsey, n.d.). With this finding they were able to redefine the way that they measured success through measuring a set of better targeted metrics. Generalizing these measures leaves us with three overarching types: impact, activity, and capacity. To better grasp these each will be defined broadly and an example provided to how it can be applied to the Natural Conservancy.

Impact measures display progress toward long term goals that are in accordance with the organization's mission and vision. Example: Biodiversity health

Activity measures display progress toward projects that influence an organization's mission. Example: Number of projects launched, number of sites protected, area of land owned.

Capacity measures show success across all levels of the organization, depicting their ability to complete tasks. Example: total membership, assets, funding received, market share etc.

First Impressions

Experiencing Caras con Causa in person allowed us to develop a stronger understanding of how the organization functions and what its values are. Their main headquarters in Cataño was hard to navigate initially. Their entrance is always locked and there were no big signs that indicated where to go. The office is a long, one-story building that consists of rooms similar to school classrooms. There is no air conditioning, and the dress code requires us to wear pants and a nice shirt. Additionally, we visited the highschool that Caras con Causa helps run, and they have their school room set up in a basketball court. There, we met with Michael Fernández-Frey and it became clear how important his role is to Caras con Causa. Overall, despite their smaller, scattered structure, it is clear that Caras con Causa are hardworking, passionate, and down to earth people who are committed to their mission.

Data Collection

Caras con Causa Data Collection Process

At the time of writing, Caras con Causa collects their data through a manual process. At every event paper forms are handed out to participants/volunteers with fields to fill out such as their name and the time they started. Once all of this information has been collected it is not immediately transferred to a digital format. Instead, some time after the event a staff member reviews the data collected on paper and then fills out a Google Form containing the information about the event. Each form is specific to the program running the event and automatically fills out a spreadsheet based upon the responses on the form. Since the form entry process is fully manual there is often a large latency between when data is collected and when it is put into Caras con Causa's systems. Furthermore, data is lost between its collection and its entry into the forms. The forms only request generic information about the project such as number of volunteers, type of project, supervisor overseeing it, and other broad details. As such any individual identifiers such as the names collected are lost in the process, leading to double

counting of individuals who work on more than one project with the organization and preventing the organization from obtaining an accurate count of all active volunteers or participants at any given time.

Linkage between Forms and Spreadsheets

Caras con Causa used Google Forms to collect data for their projects. Each project had at least one form and an attached spreadsheet. Google Forms works by collecting data through a list of questions and storing the answers in a spreadsheet. More specifically, one form response translates to a single row with multiple columns of entered data.

Volunteers vs Participants

Caras con Causa divided their data collection into two different categories: volunteers and participants. Participants primarily consist of local schoolchildren who are involved in Caras con Causa's many educational programs or are completing mandatory service hours. Volunteers are a more general group, consisting of any individual who chooses to work on the project. This includes external parties as well as schoolchildren who are doing extra work outside their education program. The reasoning behind this split is to demonstrate civic contributions, which are important to the organization's funding and self reflection.

LabCom Data Collection Architecture

Caras con Causa collects their data using the system defined in Figure 5. The first recording starts with pen and paper, which is then manually entered into Google Forms at a later date. In LabCom's case, there are two forms. One that collects the overall statistics of an event, such as total amounts of hours worked and total number of volunteers. The second collects the individual contributions per person, and is separated into three important tabs: a master tab, a volunteers tab, and a participants tab. This system does not tailor well to the goal of this IQP, and the issues it presented are discussed below.

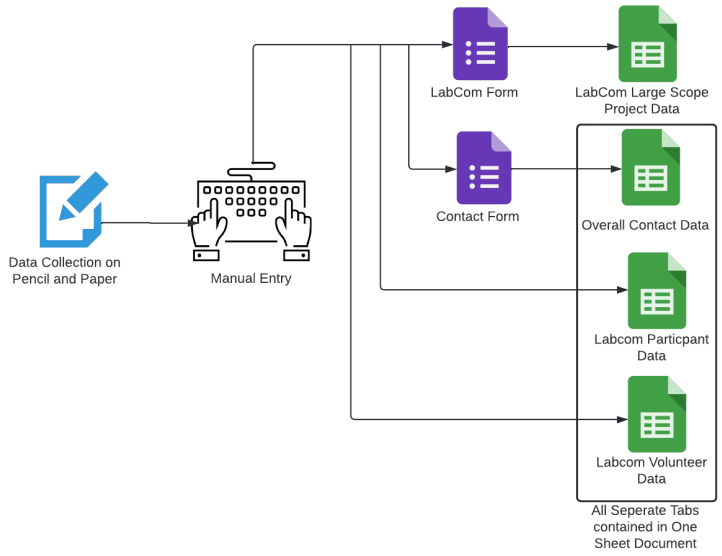


Figure 5, LabCom Data Collection Architecture

Issues

Caras con Causa started collecting data in 2020 and therefore still has to fix many of the issues inherent in their system. As described previously in this chapter, Caras con Causa uses Google Forms in tandem with pencil and paper for data collection and Google Sheets for data storage. Unsurprisingly this system requires little technical expertise and therefore does not require an individual to maintain/improve it. However we believe this is an issue because without such an individual, the organization is slowly accumulating technical debt represented by the design and process issues described below.

A glaring issue in this system is the use of pencil and paper. While it is a comfortable choice for the organization, it leads to a plethora of problems. After recording data on pencil and paper during a project event, someone needs to enter this data into a Google Form to record it in their Google Spreadsheet. Not only is this process not time efficient, but it also lends itself to human errors such as: losing a physical sheet of data, misspelling entries, forgetting

entries, etc. Additionally, this process forces the data to lag behind its actual state based on how quickly individuals enter their data into a Google Form. This makes the organization's progress towards its goals unknown at any given time which has the potential to limit its ability to attract donors.

The organization's data system also has a lack of centralization and consistency. Each program within Caras con Causa's four major impact areas has its own set of spreadsheets and forms each which can have a different format. This complicates centralizing data and thus visualizing it as many Spreadsheets must be combined.

Within Caras con Causa's Google Forms they allow a "catch all" answer for some of their questions which permits a user to enter whatever they wish. While this provides a good user experience by allowing them to answer with a special circumstance, it complicates data visualization and analysis. Typos and different spellings of the same word appear as distinct data points.

Chapter III: Research Methods

Introduction

Caras con Causa is one of many NPOs who struggle to effectively analyze their project data and trends, as well as communicate their impact to donors and other stakeholders. Currently, the organization has to dig through countless spreadsheets and form responses in order to find information relevant to their organizational growth and grant writing. This makes it very difficult and time consuming for the organization to report upon its progress and determine where it needs to improve. Previously, the organization's sole data outlet was an annual impact report. While this kept the local community and donors up to date once a year, it failed to reach the general public. To improve organizational success, Caras con Causa could display this data in two ways: publicly to reach new donors and volunteers and privately to monitor organizational success and provide donors with more precise statistics. Therefore the primary goal of our project is to help Caras con Causa with data visualization to track their projects and also to create a solution for the organization to monitor the data in real time. Throughout the rest of this chapter we will describe the key components of our project.

Evaluation and Selection of Dashboard Technology

In this section, we evaluated different data-driven dashboard solutions or an "information management tool used to track, analyze, and display key performance indicators, metrics, and data points" (Howard, 2022) and ultimately chose to work with Google Data Studio.

Caras con Causa mainly collects data such as type of project, school, teacher, and attendance. This data is split between volunteers and participants who are the two largest contributing groups to Caras con Causa projects. However, Caras con Causa described to us that they wanted to use this data to better visualize breakdowns between hours worked, projects, and schools. Given that Caras con Causa is a small, fast-growing NPO, they face several limitations as outlined in our background chapter. Firstly, Caras con Causa lacked technical expertise in their staff during the time of our project. As a result, the solution that we chose to implement had to be easily accessible by people that lacked a technical background. Secondly, the dashboard had to be interactive and versatile so that it can efficiently display the breakdowns that they desire.

Due to the various factors that impacted what dashboard solution we could implement for Caras con Causa, we generated a table to compare several different factors that needed to be present in our solution. Google Data Studio's ease of access as well as its free price point, made it an excellent fit for our project. Furthermore, Caras con Causa was pleased with this decision upon our first sponsor meeting.

Table 2: Comparison Table of Requirements for Dashboard Solutions

Requirements	Google Data Studio	Tableau
Flexibility with data sources	Able to integrate with multiple different data sources	Limited integration with Google services
Web-Based Solution	Operates entirely on the web	Tableau is meant to run as a desktop application
Pricing	Free	Paid-for service
Collaboration	Allows multiple users to collaborate on visualization at the same time	Allows multiple users to collaborate on visualization at the same time
Real-Time Data Updates	Has capability for Real-Time	Has capability for Real-Time

	updates	updates
Learning Curve	Easy to use UI	Requires expert knowledge to fully utilize

Adapted from *Sergio*, 2021

Project Scope

After meeting with the Caras con Causa executives, the scope of the project had shifted. While we were originally planning to focus on an outward facing dashboard to help communicate the organization's impact to the general public, the project changed to the creation of an internal dashboards for each of their projects to evaluate their progress and other key metrics they wish to monitor. Because they wanted to evaluate their own activities, they weren't looking to display project specific metrics like the number of trees planted in a given year, but rather social metrics such as the number of hours donated by people and demographics of the people they interact with. This will help them see who benefited from their programs, where they need to improve contact, and show success to donors ultimately allowing them to grow their programs.

Key deliverables for this project included the creation of multiple interactive dashboards displaying the data for each of their projects and their trends. In addition to the dashboard, a user's manual was created to ensure the continued upkeep of the dashboard. If there is time after creating an internal dashboard for each of the organization's projects, we also plan to create an outward-facing dashboard on their website with metrics targeted to donors and parents of volunteers, as these were the groups identified to visit the site rather than the general public.

Creation of a Maintainable Dashboard

As an organization, Caras con Causa lacks specialized personnel dedicated to technical support or development. Inevitably, once we create the dashboard, it will require maintenance and even extension based on future needs. Therefore we ensured that our dashboard was both user friendly and easy to extend. While the software we used (Google Data Studio) is simple compared to other solutions, there is still a learning curve for those who are unfamiliar with it. To ensure the dashboard's continued ease of use and extendability, we created a media driven usage guide to help Caras con Causa members maintain and extend it.

When designing software for those without technical expertise, it is important to consider navigability and accessibility. Navigability is defined by a user's ability to find desired

content. Oftentimes this is accomplished by a descriptive section title alongside the ability to search for content. Accessibility is defined by how easy content is to absorb. Accessibility is especially important because the intended audience is bilingual with a preference for Spanish. Through these definitions we will discuss two forms of possible media we could use for documentation: a text document and a video series.

Text Documentation

To create written documentation for the dashboard, we believe Google Docs is an effective solution as it is both easily accessible and navigable. Furthermore, the Caras con Causa team is already familiar with the software and uses it for internal documents, meaning that it would require no additional training.

For navigability using Google Docs' document outline provides a simple layout of the document, where each section can be navigated to and from with a click. Accessibility is harder to achieve. A possible solution for this includes providing pictures which further describe a step or a feature's explanation. Ultimately, the accessibility of the document will come down to our ability to write clear and cohesive explanations of topics, which can be achieved through iterative peer review and user testing.

Video Documentation

Video tutorials are also commonly used for explaining tasks. Video tutorials are powerful because they can be directly followed alongside a demonstrator, allowing the user to accomplish the given task at their own pace while being shown an example. This generally makes videos more accessible as explanation is coupled with visual stimulus, and textual confusion is often cleared up by the sequence of actions the demonstrator makes. While highly accessible, videos are somewhat limited in terms of navigability. Video titles and their descriptions provide insight into the videos content, but it is not feasible to search video content to find a desired keyword or phrase, making fine grained search impossible.

The decision between text or video documentation depends on which factor Caras con Causa is willing to sacrifice: navigability or accessibility. Through discussion with Caras con Causa, we have decided upon text documentation supplemented with screenshots or short animated gifs that walk through steps. Ultimately, the purpose of documentation is to ensure that members of the Caras con Causa team can achieve basic familiarity with the systems implemented in our solution.

Chapter IV: Dashboard Creation

Creation of an Internal Dashboard

During our initial meeting with Caras con Causa leader Michael Frey, we determined that they wanted an internal dashboard to monitor their progress on projects, and that we should prioritize the creation of the internal dashboard. They plan to use the dashboard to track project progress over time and to display their data to donors during pitch meetings. It was also decided that our first priority was to create a dashboard for the organization's environmental and community programs. These two programs were targeted because the organization feels they have the most trouble gathering volunteers for them. The following section discusses the creation of an internal dashboard for Caras con Causa, the issues that arose throughout the course of the project, and how we dealt with each of these challenges.

Data Cleaning

Caras con Causa stores their data in a number of Google Sheets, one sheet per program to store event information and two additional sheets with information about individuals. When we began working with the event data, we found a number of issues that made real-time visualization difficult, such as duplicated column names and non standardized entries. In order to create a dashboard with Caras con Causa's data, it first needed to be cleaned so that it was ready for visualization.

Duplicated Column Names

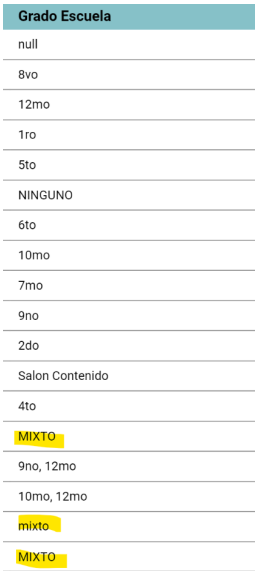
In order to link a Google Spreadsheet to a Google Data Studio project all of the columns must have unique headers. This is to ensure that each column is uniquely identifiable by column title. Initially Caras con Causa's data had many duplicates in their column names due to similarities in the data they collected. For example, many of the projects contain both participant and volunteer data that share fields such as "Project Worked on", "Activity Performed" and "Total Hours Donated". To fix this we added identifiers to each column title, for example transforming "Project Worked on" to "Volunteer Project Worked on". These changes were also made to the Google Forms that Caras con Causa uses to collect their data to ensure uniformity.

After making all column headers unique we were able to link the data to a Google Data Studio project, allowing us to leverage the software's functionality to further clean the data. One such tool is the creation of tables that display all of the entries in a single spreadsheet

column. By displaying every entry in a specific column of data we were able to identify errant data at a glance and use that information to correct it in the spreadsheet.

Manual Form Entries

In a few of the questions within Caras con Causa's project forms they permit users to deviate from the provided answer choices to write a custom input. While this allows users to express something they otherwise could not, it leads to the problem displayed in Figure 6, where capitalization and spaces unnecessarily creates multiple keys. Within the Google Sheet, we standardized entries such as "MIXTO" and "mixto" into "Mixto". This tedious process was done in the teacher, grade, and project name columns. To prevent this issue from occuring again, we met with Caras con Causa and decided to remove custom entry options from questions and replaced them with generic, catch-all options such as "Other".



Grado Escuela
null
8vo
12mo
1ro
5to
NINGUNO
6to
10mo
7mo
9no
2do
Salon Contenido
4to
MIXTO
9no, 12mo
10mo, 12mo
mixto
MIXTO

Figure 6, unstandardized entry example

Empty (Null) Values

When a user fills out a form for a Caras con Causa project, they first select the information they wish to enter from a variety of different options. These options determine the subsequent questions the user is asked. Since each form entry corresponds to a single row of data, any questions left unanswered in a form entry will be left as blank. For example, a form with 3 dropdown options that when selected prompts the user with 2 unique questions will generate the 2 questions answers along with 4 empty values in the resulting spreadsheet when the form is entered. Instead of redefining the way Caras con Causa collects their data, we leveraged the filter feature present in Google Data Studio, to remove null data from consideration.

Comma Separated Values

Prior to this project, some of the questions in Caras con Causa's Google Forms allowed users to select multiple answers through a checkbox. This feature was intentionally chosen to make batch data entry easier. When doing so the selected options appear as comma separated

values. This complicates data visualization as the individual information about each value cannot be known. One situation we encountered was that a single entry of the solid waste monitoring activity had participants across grades 6-12 producing a total of 280 volunteer hours. With this information it is impossible to determine the number of students of any given grade that attended the activity, preventing the organization from determining accurate grade specific metrics. Based on this observation we recommended that the organization remove checkboxes from Google Forms to prevent this complication in the future.

Dashboard Development

The creation of our dashboard solution has been completed through an iterative design process. We begin an iteration by meeting with key stakeholders from our sponsor to discuss goals and ideas to implement for each draft. We then used the work week to create a prototype incorporating our discussions. Once a polished prototype was created, we returned to meet with the same stakeholders to discuss feedback and any problems we ran into. During these stakeholder meetings, we also often brainstormed new features to add and their feasibility of completion. At the end of our time with our sponsor we created a dashboard for the LabCom program that is intended to be used as a template for other programs in the future.

Prototype 1 - Initial Draft

In order to better understand how Caras con Causa wanted to use their data we met with the coordinators of the LabCom and Urban Roots programs. From these conversations we learned that their primary measurement of success was the number of participant and volunteer hours that their programs attract. Additionally, they wanted to specify groupings of these hours based on participant/volunteer, project, community, school, and school grade. With this information we created our first dashboard with LabCom's event data.

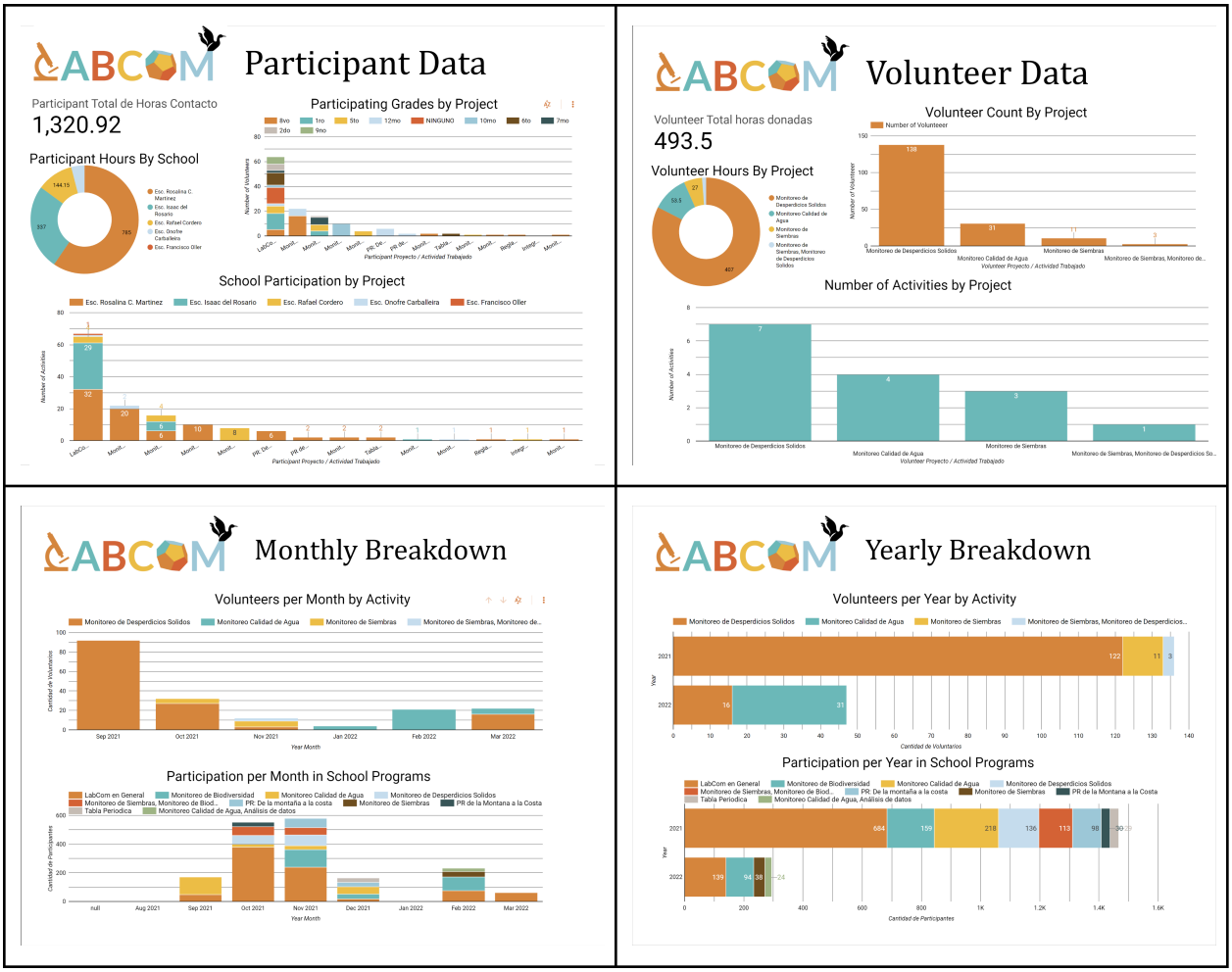


Figure 7: LabCom Dashboard Draft 1 - The first iteration of the LabCom dashboard and our initial attempt at demonstrating the relationships between each of the metrics recorded by the LabCom program.

Feedback

Caras con Causa provided feedback on this dashboard and a few changes were mentioned. The first is that the colors used must match the organization's color scheme. The second was that the dashboard must be made more interactive. The reason for this need of interactivity is that oftentimes when pitching their organization to donors they are asked very specific questions. The example they provided was a pitch meeting with Lego League Robotics for $10,000, where the representative asked about female participation within certain programs. With our current dashboard the organization would not be able to visualize data at that level of specificity.

Prototype 2 - An Interactive Dashboard

To implement interactivity we used two Google Data Studio features together: parameters and calculated fields. The layout of our dashboard in this iteration is also purposeful. At the beginning we provide a snapshot of the entire LabCom success metrics. To compute these metrics both volunteer and participant data were combined into a single dimension. As you scroll down the dashboard the charts become more interactive and at the bottom full interactivity is permitted, allowing the user to choose all chart inputs.

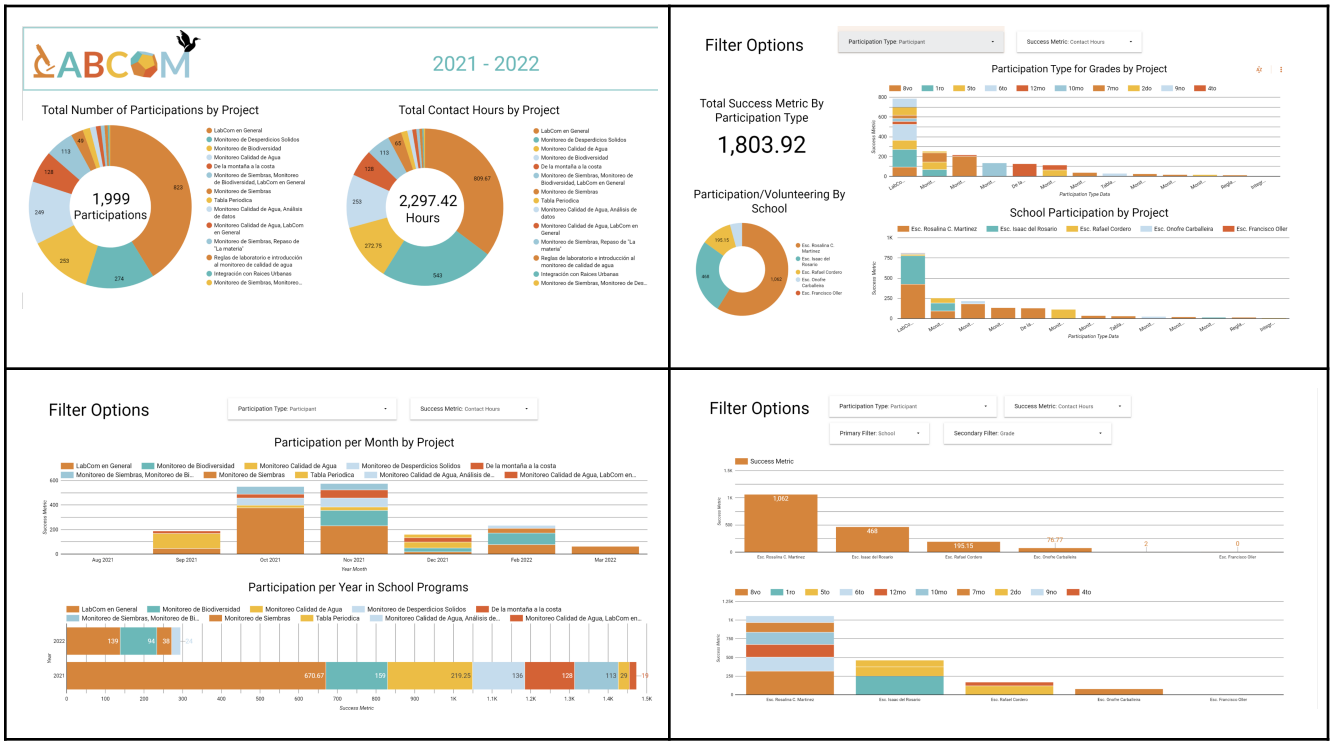


Figure 8: LabCom Dashboard Draft 2 - The primary difference between this draft and the first is the introduction of interactive elements that allow the user to customize how the data is displayed. This allows Caras con Causa to tailor what is shown to their audience and view more specific comparisons in the data.

Parameters and Calculated Fields

In order to make the dashboard more interactive, we included drop down menus that allow a user to select what is displayed on its linked charts. For example, a user can use these

filters to control attributes like which schools are displayed, which projects are displayed etc.

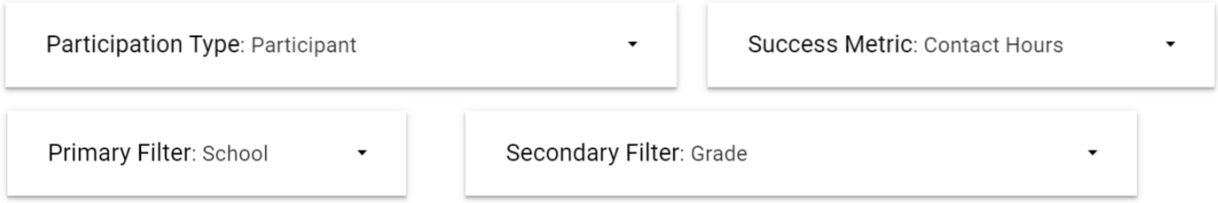


Figure 9: Drop down menu Example

In the context of Google Data Studio, these controllable filters are called parameters. Parameters work similar to an enumeration, where a parameter's value can only be selected from a fixed number of options. In Google Data Studio parameters are changed based on user input such as a drop-down selection. The value of a parameter can then be used within a calculated field to dynamically switch which fields are displayed on a chart. Calculated fields make use of function operations to create a new field depending upon any number of input fields. These two concepts proved to be incredibly powerful as they allowed us to reduce the number of charts needed to display all the necessary information, as well as provide a greater level of interactivity to the dashboard.

Combining Participants and Volunteers

A feature that was unavailable in our initial prototype was the ability to view the contributions of participants and volunteers in a single chart. In order to display all of this information we needed to combine participant and volunteer data in such a way that it keeps only the unique occurrences from each of the two sets while combining duplicates. For example *Table 3* would transform into *Table 4*.

Table 3: Combining Participants and Volunteers Before Combination

Project	Number of Hours	Participation Type
LabCom P1	2	Volunteer
LabCom P1	4	Participant
LabCom P2	2	Volunteer

Table 4: Combining Participants and Volunteers After Combination

Project	Number Of Hours

LabCom P1	6
LabCom P2	2

However, this functionality does not explicitly exist in Google Data Studio, so we needed to write logic to perform this operation. Since being a participant/volunteer is mutually exclusive in a single event (ie. you can only be a participant *or* a volunteer not both), if the current row contains participant data it does not contain volunteer data. Therefore, to determine the number of participations for both volunteers and participants by the LabCom program two IFNULLS are used. One combines the projects into a single table and the other does the same for the number of participants.

Feedback

Caras con Causa was extremely pleased with the second iteration of our dashboard and provided a few specific feedback points. The first was to change the time scale used to reference the academic calendar, using semester and academic year instead of month and year. The second was to provide a fine grained way to filter specific fields. This means when filtering by school, the user should be able to select the specific schools to filter out/in. It was also recommended that we explore different visualizations aside from the bar and donut chart as certain information such as time relevant data can be visualized in more descriptive ways.

Additionally, as conversations progressed with the Caras con Causa team, they expanded the information they would like the dashboard to include. Firstly, let us define a few vocabulary words to make future explanations more clear:

Event: A timeframe where multiple *projects* associated with a *program* occur. Note that multiple events may happen in a single day.

Program: Programs focus on one of the four central focuses of Caras con Causa. An example of a program is LabCom which focuses on the environment. Programs can have multiple *projects*.

Project: An activity that is performed within a *program*. For example, the LabCom *program* hosts the monitoring of solid waste project.

Fundamentally, Caras con Causa has stated that their ideal dashboard should include all the data they collect. The LabCom data that is left to include on the dashboard is the number of events and programs hosted in a given time period, and specific information about each program's attendees such as home town, proportion of male/female participation, parents income, school, grade etc. The issue in including events is that this information is not explicitly

recorded and to calculate it their data format had to be transformed. The issue with including specific information for individuals is that it exists within a completely distinct spreadsheet from the one we had worked with up to this point, causing us to explore a new set of problems. These issues were addressed in the third iteration of the LabCom dashboard.

Prototype 3 - Including all Information

Calculating Event Totals

In order to transform Caras con Causa's data set into a format that includes information about events, we developed a Python Script. This allowed us to automate the reformatting of the data, preventing potential human error and speeding up the process. Furthermore, the script was created such that it could be easily adaptable to any of our sponsor's other data sets. The new format of data works to combat two main issues found in the previous data model:

1. The number of participants should be known for both events and projects. This means that columns regarding the number of volunteers, participants, and volunteer leaders need to be added for events.
2. In the previous data model, a single row contained information for an entire event. As a result, multiple projects were separated by commas. This means that each row must only contain a single project

Given these two issues, we added four new columns to the data. The first added column determines whether a given row should mark the start of a new event. We utilized this column mainly when splitting apart comma-separated project values. The main purpose of this column was to implement a way to calculate the total number of events for a given program. The last three columns added store information for the number of volunteers, participants, and volunteer leaders for an event. The following two tables show an example of what the data looks like before and after transformation (participant and volunteer leader columns were left out for simplicity):

Table 5: Previous Data Format Example

Project	**Number of Volunteers**	**Hours Donated by Volunteers**
LabCom P1, LabCom P2	10	10
LabCom P1	6	3

Table 6: New Data Format Example

Project	Number of Volunteers	Hours Donated by Volunteers	Is New Event	Event Volunteer Total
LabCom P1	10	5	Yes	10
LabCom P2	10	5	No	
LabCom P1	6	3	Yes	6

Tracking Individuals in LabCom

One feature that is very important to Caras con Causa for tracking their program success is to see how specific individuals interact with their program. To visualize the total number of individuals in LabCom and the hours they contributed we blended the data from the contacts sheet with the participant and volunteer sheets, making sure to combine shared names. This allowed us to generate a table to look up the total hours of each individual in LabCom. We also applied three drop down controls in order to make the table searchable by name, municipality, and graduation year for students..

Figure 10: LabCom Lookup Table - This table contains the hours contributed by each person in LabCom, broken down by participant and volunteer hours. It also includes additional information useful to Caras con Causa such as the individual's zip code, annual household income, and their gender.

Creating a Lookup Dashboard

In addition to the LabCom specific dashboard we also made use of the contact data in order to create a lookup table to display the contributions of specific individuals to each of Caras con Causa's programs. This is especially important because the Caras con Causa model revolves around participants benefitting from each of their distinct programs . At present there are a few limitations to the lookup table as a result of the way Caras con Causa's data is formatted. While an individual's total contributions to each program can be known, there is no way to distinguish how and where those hours were spent. This is an issue that would be solved by implementing our dynamic form recommendation.

Dynamic Form

In finishing the third prototype of our LabCom dashboard we had reached a limitation to the information we could display. For instance, with Caras con Causas current data format there is no way to extract important information such as the projects an individual has attended, or the number of hours a person has donated to a specific project. The problem stems from their data lifecycle. To better display this, we created the following image.

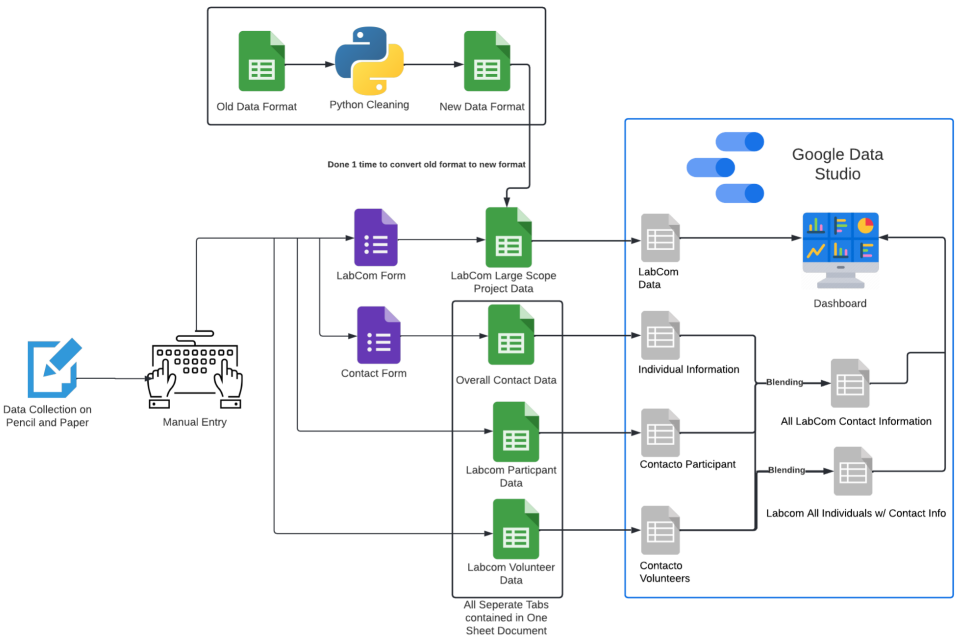


Figure 11: Caras con Causa LabCom Architecture after creation of our third LabCom dashboard iteration.

The issue we ran into is that Caras con Causa collects data for LabCom in two ways that are disjoint from each other. The first is through the LabCom form which collects data at the project level, where each row in the data is a specific project. The other is within the Contact Information spreadsheet, which contains multiple tabs, where each tab is its own spreadsheet. One of these tabs contains the specific information for each individual. Each of the other tabs contain manually collected hours by participation type described in 2b. Therefore LabCom has two tabs within this spreadsheet, one for participants and another for volunteers. These two data sets are disjoint because they contain no data in common that links them together.

Furthermore these two data sets include redundant information. As highlighted by Figure 12, both spreadsheets include the same social metric, hours donated, but in different scopes. The contact spreadsheet contains the information at the individual level, while the

LabCom spreadsheet includes it at the project level. This would simply be a problem of data duplication but because the information is not linked together as mentioned previously there is no way to gather project information for each individual.

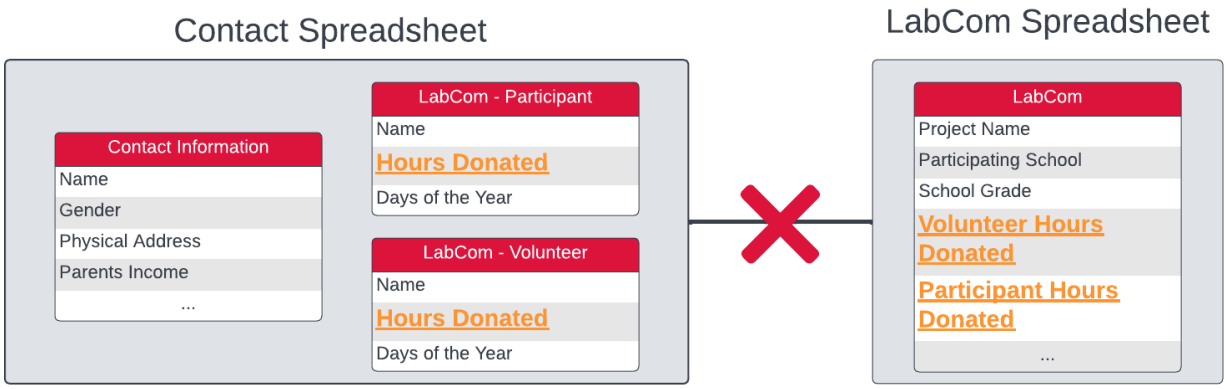


Figure 12: Repetition of social metrics and disconnection of LabCom Data.

Through conversations with Caras con Causa, we concluded that the ideal solution to this problem would be to store LabCom data in a single place. Additionally the data contained in this single spreadsheet should be at the smallest level possible, but contain information at the largest scope. For LabCom the smallest scope is the individual and the largest is each project. By doing so, we can use Google Data Studio functionality to display information at any level necessary, such as number of attendants in a given year for a specific project as well as the people that have participated in more than 50 hours of LabCom projects.

To meet these requirements we needed to adapt the LabCom form to include attendance information. However the issue with this, is that the individuals and groups that Caras con Causa serves can change at any moment. In designing our solution we centralized this information so that if this solution is applied to other forms, all forms could use the same consistent set of people. The format of this information is divided into groups, which are further divided into sub groups, where each sub group contains individual names.

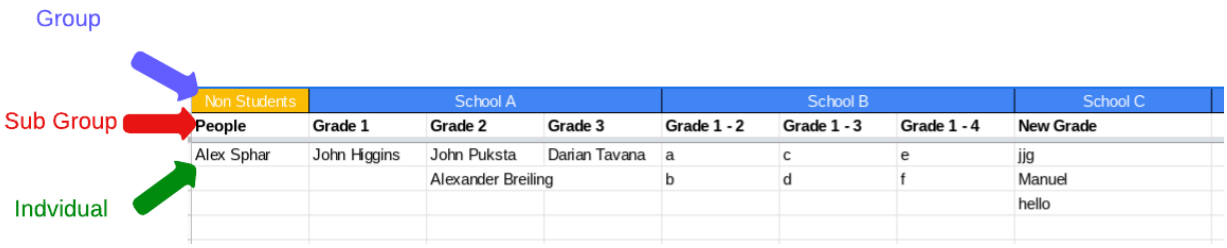


Figure 13: Centralized list of people caras con causa serves

From this central spreadsheet that contains the groups of people Caras con Causa serves we developed a product using a library developed by Google called App Script. This library allows us to write JavaScript to add functionality to Google products including Google Forms and Sheets. Using App Script, we developed code that can create, update and delete form questions that collect information about the group, sub group and individuals that attended the project the form is being filled out for. Within the attendance questions the user is first prompted which group they are filling out the form for, they then are asked to pick a subgroup from that group and finally to select all individuals from that subgroup that attended the project. The format of the data this form outputs is extremely hard to programmatically analyze because of the number of questions created by our code. However, we wrote additional App Script code that runs every time the form is submitted which transforms the data into a format that only includes group, subgroup and individual.

Through our creation of a simplistic but robust dynamic form creator, we transformed Caras con Causas LabCom form to a format that can display all possible relationships they wish to provide. Additionally we designed this solution to be easily adaptable to other forms, by simply copying and pasting a form link into a dialog box and code into the in form submission event. If Caras con Causa decides to move forward with using our work, the following image would represent their new architecture.

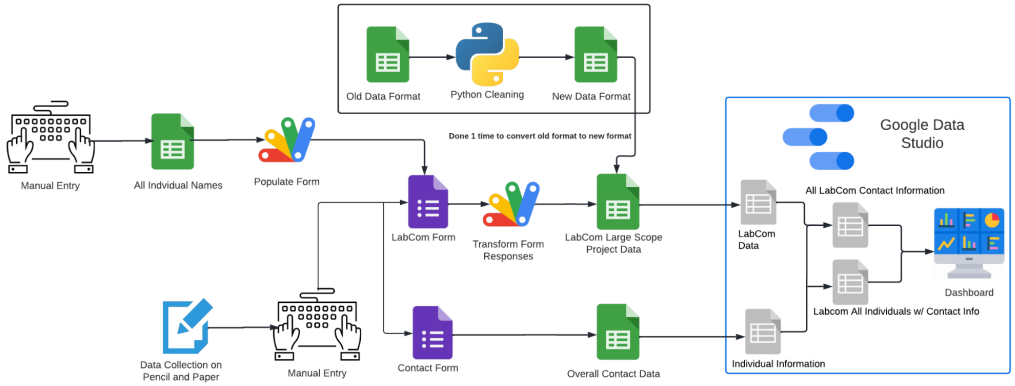


Figure 14: Centralized list of people caras con causa serves

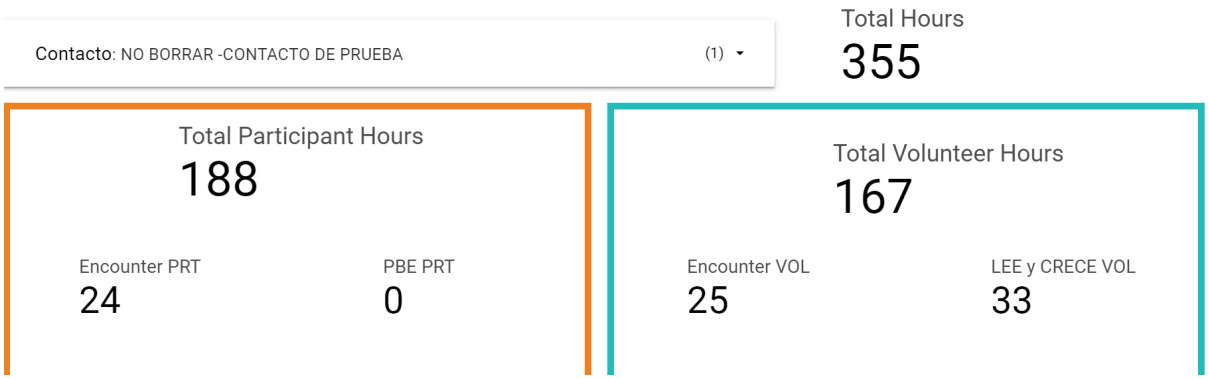


Figure 15: Caras con Causa Lookup Dashboard - Using the lookup dashboard we created, we are able to see the contributions of a test contact broken down by each program at a glance.

Chapter V: Recommendations and Conclusion

Our first recommendation for Caras con Causa is to make sure that all individuals that participate in programs are present in the main contacts sheet. There are several individuals present in the participant and volunteer sheets that do not appear in the contacts sheet. We highlight these individuals on the third page of our final prototype.

Our second recommendation for Caras con Causa is to continue to advance data practices throughout the organization. Part of our IQP involved improving data practices specifically for the LabCom program. By adapting these changes to all programs within the organization, analyzing data in the future will be a much more straightforward process. Evolving data practices includes standardizing all Google Forms used to collect data, building upon our dynamic forms prototype, condensing the amount of data sources for each program to be a singular sheet containing all necessary information, and moving away from manual data collection.

Our third and final recommendation is to adapt our LabCom prototype to other programs. This process will be much more streamlined once data practices have been improved throughout the organization.

Ultimately, our project worked to combat the broad societal problem that NPOs struggle to communicate their mission statement through data. Through several conversations with the Caras con Causa team as well as numerous design iterations, we developed a refined Google Data Studio dashboard that visualizes a suite of information for the LabCom program. Through this process, we also worked to improve data practices throughout the organization by making small changes to data format and collection where necessary. Through our project, we hope

that Caras con Causa will not only be able to understand their organization's growth overtime, but also provide key metrics to donors in order to receive funding.

References

American Museum of Natural History. (n.d.). *Mission Statement.* American Museum of Natural History. Retrieved February 7, 2022, from https://www.amnh.org/about/mission-statement

American Red Cross. (2022, February 9). *American Red Cross.* https://www.redcross.org

Arizona Humane Society. (2022, February 9). *Home Page.* Arizona Humane Society. https://www.azhumane.org/

Center For Puerto Rican Studies. (2021, September). *Enduring Disasters: Puerto Rico, Three Years After Hurricane María | Centro de Estudios Puertorriqueños.* https://centropr.hunter.cuny.edu/research/data-center/research-briefs/enduring-disasters-puerto-rico-three-years-after-hurricane

Ciucescu, N. (2009). *The role and importance of Non-Profit Organizations.* STUDIES AND SCIENTIFIC RESEARCHES. ECONOMICS EDITION, 14, Article 14. *https://doi.org/10.29358/sceco.v0i14.35*

Dopson, E. (2021, June 28). *Videos vs. Images: Which Drives More Engagement in Facebook Ads?* | Databox Blog. Databox. https://databox.com/videos-vs-images-in-facebook-ads

Dutta, S. (2020, September 9). *Nonprofit Impact Report: How to Visually Communicate Your Impact.* InsideCharity.Org.

https://insidecharity.org/2020/09/09/nonprofit-impact-report-how-to-visually-communicate-your-impact/

U.S. EPA. 2002. Methods for Evaluating Wetland Condition: *Introduction to Wetland Biological Assessment*. Office of Water, U.S. Environmental Protection Agency, Washington, DC. EPA-822-R-02-014.

EveryAction. (2018, March 18). *5 Things You Need to Know about Nonprofits + Big Data.* EveryAction. https://www.everyaction.com/blog/5-things-you-need-know-about-nonprofits-big-data/

Foster, W. L., Kim, P., & Christiansen, B. (2009, Spring). *Ten Nonprofit Funding Models (SSIR).* https://ssir.org/articles/entry/ten_nonprofit_funding_models

Fruchterman, J. (2016, Summer). *Using Data for Action and for Impact (SSIR).* https://ssir.org/articles/entry/using_data_for_action_and_for_impact

GiveDirectly. (2022, February 9). *GiveDirectly: Send money directly to people in poverty.* GiveDirectly. https://www.givedirectly.org/

Find. apply. succeed. GRANTS.GOV. (n.d.). Retrieved April 30, 2022, from https://www.grants.gov/web/grants/learn-grants/grant-reporting.html

Hachette Book Group. (2022). *Travel Maps of Puerto Rico*. Moon. Retrieved from https://www.moon.com/maps/caribbean/puerto-rico/

Helen Keller Intl. (2022, February 9). *Helen Keller Intl—Continuing Her Work.* Helen Keller Intl. https://www.hki.org/

Hernández, E., Cuevas, E., Pinto-Pacheco, S., & Ortíz-Ramírez, G. (2021). *You Can Bend Me but Can't Break Me: Vegetation Regeneration After Hurricane María Passed Over an Urban Coastal Wetland in Northeastern Puerto Rico. Frontiers in Forests and Global Change, 4.* https://www.frontiersin.org/article/10.3389/ffgc.2021.752328

Hevo. (2022, February 9). *Google Data Studio Pros and Cons: A Detailed Analysis.* Learn | Hevo. https://hevodata.com/learn/google-data-studio-pros-and-cons/

Ibrisevic, I. (2022, April 20). *Top funding sources for nonprofits and charities in 2021: Donorbox.* Nonprofit Blog. Retrieved April 30, 2022, from https://donorbox.org/nonprofit-blog/nonprofit-funding-sources

Intersimone, R. R., Katherine Kokal and Jenna. (2021, November 1). *Recession, hurricanes, service cuts: Why Puerto Ricans are leaving the island for the mainland.* USA TODAY. *https://www.usatoday.com/story/news/politics/2021/11/01/puerto-rico-losing-population-mainland-u-s-census-data/5988403001/*

Manic, M. (2015). *Marketing engagement through visual content .* Series V: Economic Sciences, 8, 89–94. http://webbut2.unitbv.ro/BU2015/series%20v/BIletIn%20I/12_Manic.pdf

Mayol-García, Y. H. (2020). *Pre-hurricane linkages between poverty, families, and migration among Puerto Rican-origin children living in Puerto Rico and the United States. Population and Environment, 1–22.* https://doi.org/10.1007/s11111-020-00353-7

McKinsey. (n.d.). *Measuring what matters in nonprofits | McKinsey.* Retrieved February 7, 2022, from https://www.mckinsey.com/industries/public-and-social-sector/our-insights/measuring-what-matters-in-nonprofits

Mercier, R. (2020). (rep.). *Mass on the Border: Encounter, Hope, and Love*. Jesuits Central and Southern. Retrieved February 7, 2022, from https://www.jesuitscentralsouthern.org/wp-content/uploads/sites/14/2020/08/Jesuits-Winter-FINAL.pdf

National Philanthropic Trust. (2021, November 11). *Charitable giving statistics. NPTrust.* Retrieved April 30, 2022, from https://www.nptrust.org/philanthropic-resources/charitable-giving-statistics/

Network for Good. (n.d.). *7 steps to creating your best nonprofit marketing plan ever.* Retrieved January 29, 2022, from http://www.fundraising123.org/files/training/7%20Steps%20to%20Creating%20Your%20Best%20Nonprofit%20Marketing%20Plan%20Ever.pdf

Pearson, R. W. (2011). *Statistical persuasion: How to collect, analyze, and present data...accurately, honestly, and persuasively.* Sage.

Perreira, K., Peters, R., Lallemand, N., & Zuckerman, S. (n.d.). *Puerto Rico Health Care Infrastructure Assessment. 31.*

PRxPR. (2022, February 9). *HELP SUPPORT PUERTO RICO.* PRXPR. https://www.prxpr.org/

Riley, S. (2022, February 8). *What is STEAM Education?* The Institute for Arts Integration and STEAM. https://artsintegration.com/what-is-steam-education-in-k-12-schools/

Rotermund, M. (2019). SLU celebrates Social Justice Mission in Opus Prize Laureate, finalists' work. SLU. Retrieved May 2, 2022, from https://www.slu.edu/news/2019/november/slu-celebrates-opus.php

Sergio, P. (2021, October 29). *Tableau vs. Google Data Studio In Details. Coupler.Io Blog.* https://blog.coupler.io/tableau-vs-google-data-studio/

Shattuck, S. (2019, May 15). *Outcomes and output: Nonprofit impact reporting in the 21st Century.* Big Duck. Retrieved April 20, 2022, from https://bigduck.com/insights/nonprofit-impact-reporting-for-donor-retention/

Slatten, L. A., Bendickson, J. S., Diamond, M., & McDowell, W. C. (2021). *Staffing of small nonprofit organizations: A model for retaining employees.* Journal of Innovation & Knowledge, 6(1), 50–57. https://doi.org/10.1016/j.jik.2020.10.003

Tableau vs. Google Data Studio: Which is Better? (2022, February 9). WebFX. https://www.webfx.com/martech/tech/google-data-studio-vs-tableau/

Ebarb, T. (2019, September 7). *Nonprofits Fail – Here's Seven Reasons Why – Tracy Ebarb. Nano.* https://nanoe.org/nonprofits-fail/

Truong, T., Khosravi, Y., Pathania, Y., & DeMaio, S. J. (2021, May 12). *Information Management Platform: A Solution to Tracking Caras con Causa's Impact on Cataño and Guaynabo. Worcester Polytechnic Institute.* https://digital.wpi.edu/concern/student_works/6q182p23n?locale=en

U.S Census Bureau. (2020). *U.S. Census Bureau QuickFacts: United States.* https://www.census.gov/quickfacts/fact/table/US/PST045221

US EPA, R. 02. (2019, April 18). *Basic Information about Citizen Science [Overviews and Factsheets].* https://www.epa.gov/citizen-science/basic-information-about-citizen-science-0

Waters, R. D., & Jones, P. M. (2011). *Using Video to Build an Organization's Identity and Brand: A Content Analysis of Nonprofit Organizations' YouTube Videos. Journal of Nonprofit & Public Sector Marketing, 23(3), 248–268.* https://doi.org/10.1080/10495142.2011.594779

Whale, W. (2022, February 9). The 3 Types of Nonprofit Dashboards—And How to Build Each One. https://blog.techsoup.org/posts/he-3-types-of-nonprofit-dashboards-and-how-to-build-each-one