Optimizing Data Collection for Rescued Food in Pittsburgh

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Introduction

412 Food Rescue is a 501c3 non-profit organization based out of Pittsburgh. It began as a "direct response to the disconnect between food waste, hunger and environmental sustainability" ("What We Do" 2017). 412 Food Rescue was founded in 2014 by Leah Lizarondo, an advocate for food, health, and access in Pittsburgh, and Gisele Fetterman, founder of The Freestore in Braddock which distributes surplus and donated goods for free.

The idea for this research project originated from a class lecture at the University of Pittsburgh in Dr. Irene Mena Lora's Social Entrepreneurship class. Leah Lizarondo came in as a guest speaker, and I was inspired by the work she and the 412 Food Rescue team were doing. I identified similarities between the operations of 412 Food Rescue and the Industrial Engineering principles I was studying in classes. After meetings with Leah to identify the best space for a project, we focused on streamlining the data collection of the food rescue process.

Currently, 412 Food Rescue's employed truck drivers use a combination of paper, an electronic tablet, and a scale to record weights of the food that is rescued. Weights are recorded when the food is dropped off at the partner locations. The goal of this project is to streamline the data collection such that all members of the 412 Food Rescue team are optimizing their time and recording accurate data.

Methods

Initial Interviews

The first step of this project was understanding the initial problems that existed within the system. To understand how this project could be most useful, two initial interviews were conducted with Leah Lizarondo to understand the organization's mission and opportunities for improvement. In this setting, Leah noted that data collection is currently done manually, which she believes is an area for growth. She stated that in its current state, the data collection is meeting the organization's needs, but as the organization continues to grow, it will need a more cohesive system. She also noted that the current system is significantly reliant upon the experience of 412 Food Rescue's two truck drivers who are familiar with the routes and partners. As 412 Food Rescue continues to expand, the data collection method must be dynamic enough to keep up.

Truck Observations

The next step was conducting observations while riding along in the 412 Food Rescue truck to understand the current process. There are two different types of truck rides: two large pickups per week from Gordon Food Services in Imperial, PA, which distributes monthly donations, and five small pickups per week from the South Hills Trader Joes which distributes

weekly donations. Each of these routes uses different methods for data collection, so both were observed.

The first observation was conducted on a trip to Gordon Food Services for a monthly distribution. The entire ride from beginning to end was observed, and a task analysis with time stamps was completed to understand what tasks go into completing a larger distribution. A second observation was conducted on the smaller weekly trip to Trader Joe's. Again, the entire ride from beginning to end was observed, and a task analysis with time stamps was completed to understand what tasks go into completing a smaller distribution.

During both observations, interview questions regarding the truck process were completed to gain a better understanding of the areas for improvement.

Process Mapping

Based on the observations conducted, a process map was completed to understand the paths and bottlenecks of the process. Based on the tasks observed and their associated times, the process map visualizes each task as well as any interruptions or breaks. When creating an ideal solution, these non-value added tasks will be addressed and optimized.

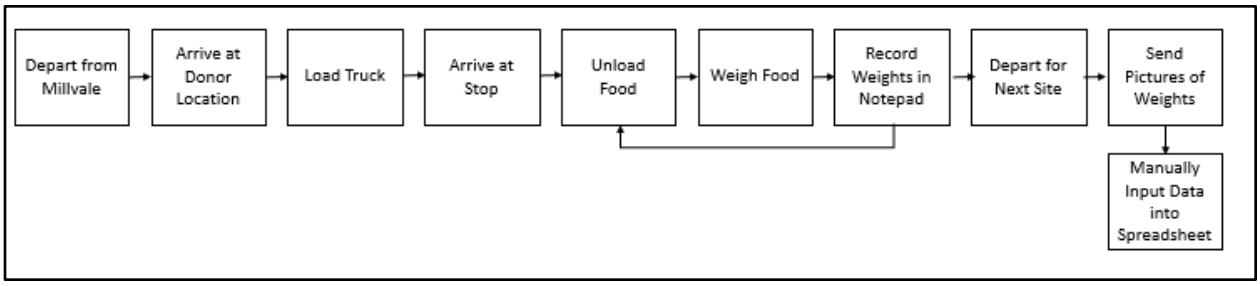

Figure 1: Process Map of Food Rescue Tasks

Benchmarking

412 Food Rescue operations are similar to other rescue organizations and to larger distribution networks. To see how 412 Food Rescue can improve, benchmarking was completed against a similar organization to understand how their processes compare.

To gain a clear understanding of how 412 Food Rescue compares to a similar organization, a call with a comparable food rescue organization, Lovin' Spoonfuls in Boston, MA was conducted. Lovin' Spoonfuls was founded in 2010 and has since rescued and redistributed over six million pounds of food in the Boston area ("About Us - Lovin' Spoonfuls Food Rescue" 2017).

Ideal Solution State

Based on the task analysis and benchmarking findings, an ideal solution was suggested to address the needs of 412 Food Rescue's data collection. The core goal of this solution was that it can be scaled up as the organization continues to grow and to add more partners and employees. This ideal state included suggestions for process and technology improvements.

Solution Rollout

Based on the solutions that are generated in the ideal state, a solution rollout plan was created so that 412 Food Rescue can implement its solutions in a staggered, effective manner. The solutions were prioritized based on ease of implementation, cost, and projected improvements. With this matrix, 412 Food Rescue leadership can make strategic decisions about how to implement the solutions to address their issues in the manner they choose.

Results

Benchmarking

Lovin' Spoonfuls uses a cloud-based inventory tracking system called ASAP Barcloud ("Homepage" 2017). ASAP Barcloud allows them to know exactly how much food is on each of their trucks and the locations where it eventually ends up. The strength of this inventory system is that it is automatically updated on the cloud so that at any given moment, anyone on the Lovin' Spoonfuls team knows exactly what their inventory is.

Process Improvements

The results of this project are two-fold. The observations and interviews generate a process map. The resulting process map shows where there are tasks and pauses within the process. The interviews share the qualitative information on the process from the two full-time drivers. Combined, these observations gave a clear picture of a standard truck trip.

As seen in the observations, there is little down time in the process of rescuing food (see **Appendix** for complete time data). The major snags in the process come later when there are lags in processing the data. For the most part, 412 Food Rescue is constantly working; however, there are times when 412 Food Rescue employees are completing tasks which are not necessarily value-added tasks. For example, taking the time to search through the truck to find food during the unloading process adds extra time to the process. Instead, if truck drivers knew exactly what food was on their truck before they got to a partner location, they could better allocate their distributions.

For this reason, the suggested process has drivers weighing the food twice: once when they are loading it on the truck from the donor site and again as they are unloading at partner sites. While this will add some extra time to part of the process, this means that the drivers know exactly how much is on their truck so they can distribute it equally, reducing time during unloading. The new suggested process is shown in the process map below.

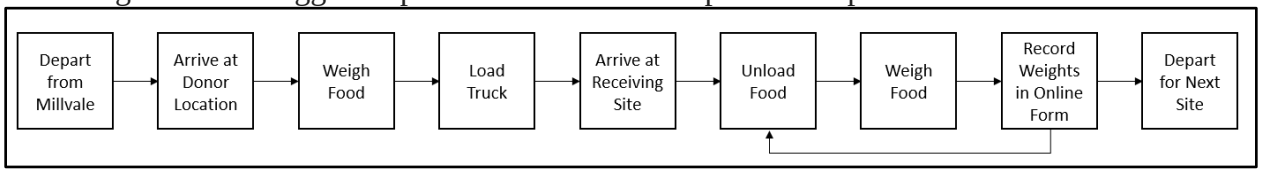

Figure 2: Suggested Process Map

Data Visualizations

To build on this finding, the next portion of the project dealt with existing data. The data showed that 412 Food Rescue has rescued more than 250,000 pounds of food in the first quarter of 2017 and has worked with hundreds of community partners.

Nearly half of this donated food is produce, followed by bread and ready to eat food. Community partners that donate food come from a variety of retail locations and vary greatly in size and frequency. On average, partners donate about 250 pounds of food per donation and donate 8.86 times per quarter or about 35 times per year. Donations are highly variable though, with average donation weights ranging from four pounds to up to eight thousand pounds. These statistics do not represent the overall operations of major partners, however. Partners such as Gordon Food Services and Trader Joe's of South Hills are exceptions since they have planned large weekly donations. These two locations alone have donated over 125,000 pounds of food in the first quarter of 2017. These findings were displayed in data visualizations created with Tableau Public as well as a map on Google Maps to demonstrate the communities that 412 Food Rescue is serving.

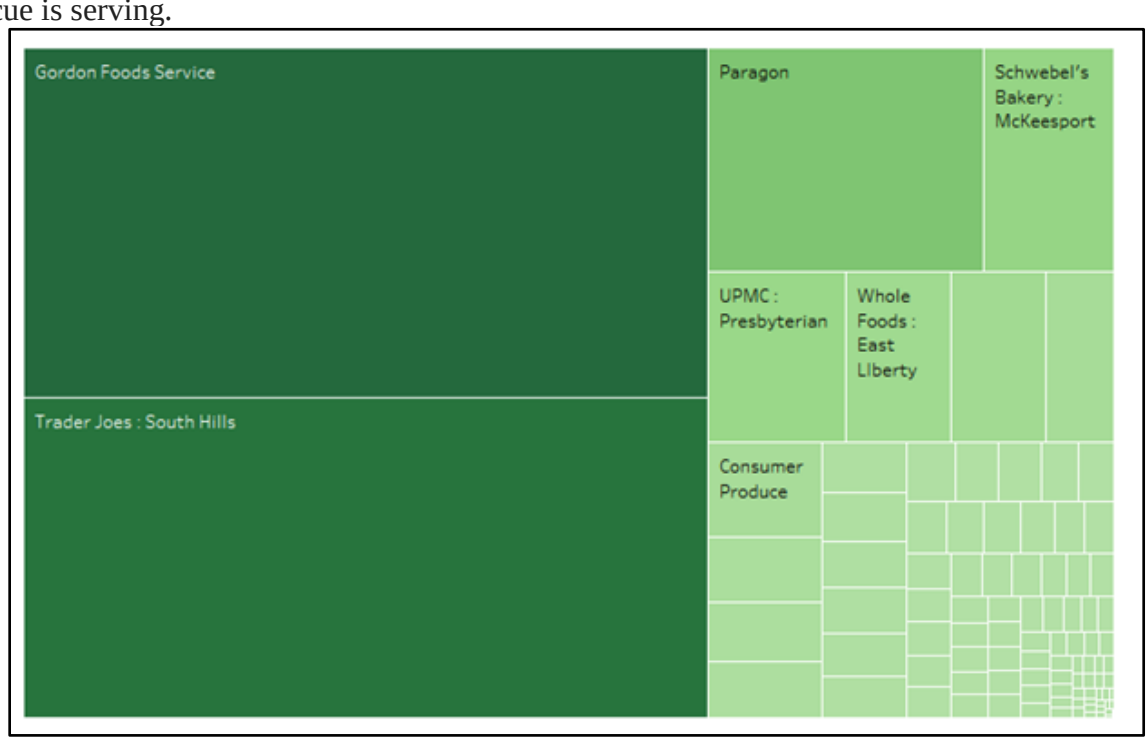

Figure 3: Sources of Donated Food

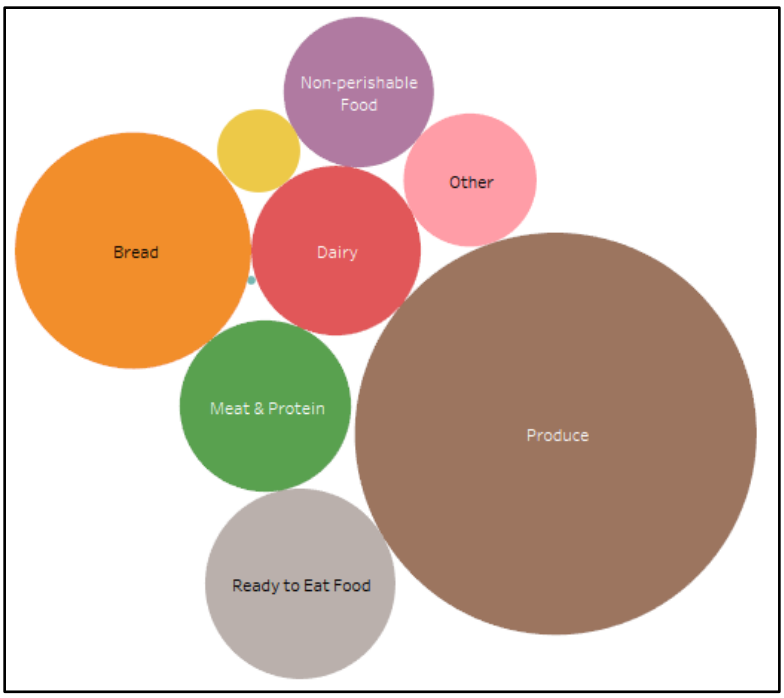

Figure 4: Categories of Donated Foods

Data Collection

Knowing the data collection that is currently being used, a new data collection form was created based on feedback from the observations. To replace paper and pen, a form was created for truck drivers to submit their donations through a Google Form, which is then automatically added to the database as well as incremented in a live inventory tracker. Truck drivers can use the form on electronic tablets or personal devices.

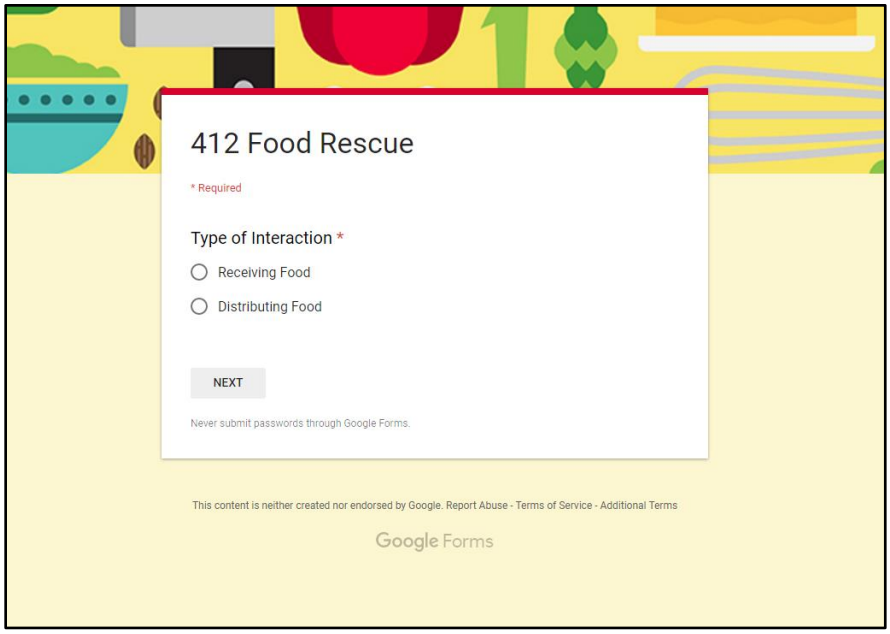

Figure 5: First Page of Suggested Data Collection Form

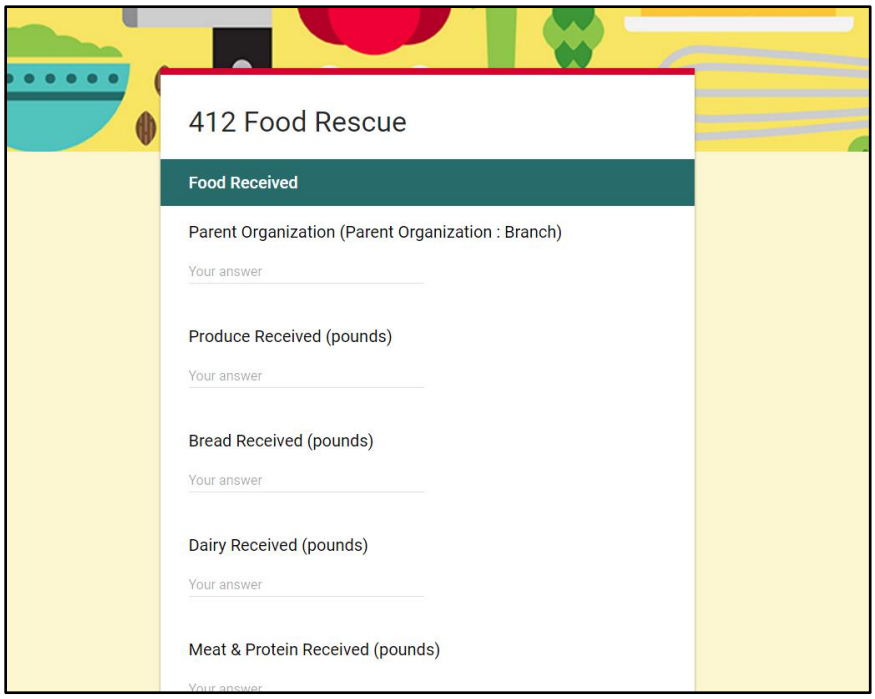

Figure 6: Second Page of Suggested Data Collection Form

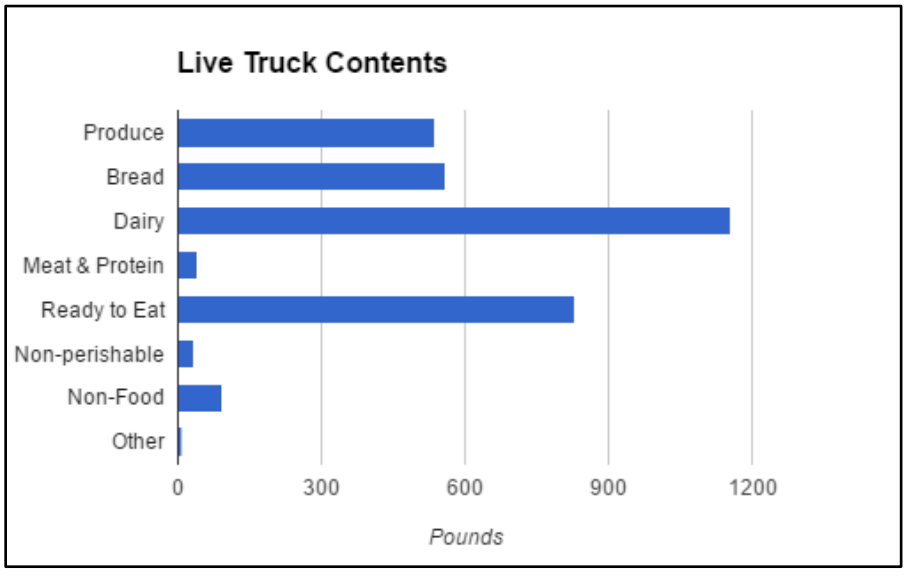

Figure 7: Example Output of Live Inventory Tracker

Discussion

The results of the data visualizations reaffirm the impressive and unique work that 412 Food Rescue is doing for the city of Pittsburgh. The interesting finding about the maps is the realization that donor and partner organizations often overlap geographically. That is, areas of food insecurity and of food surplus exist simultaneously and not in separate spaces. The data visualizations also confirm that 412 Food Rescue works with a diverse group of partners and

locations. The goal moving forward will then be to continue to track this data and present it in a way that best tells 412 Food Rescue's story.

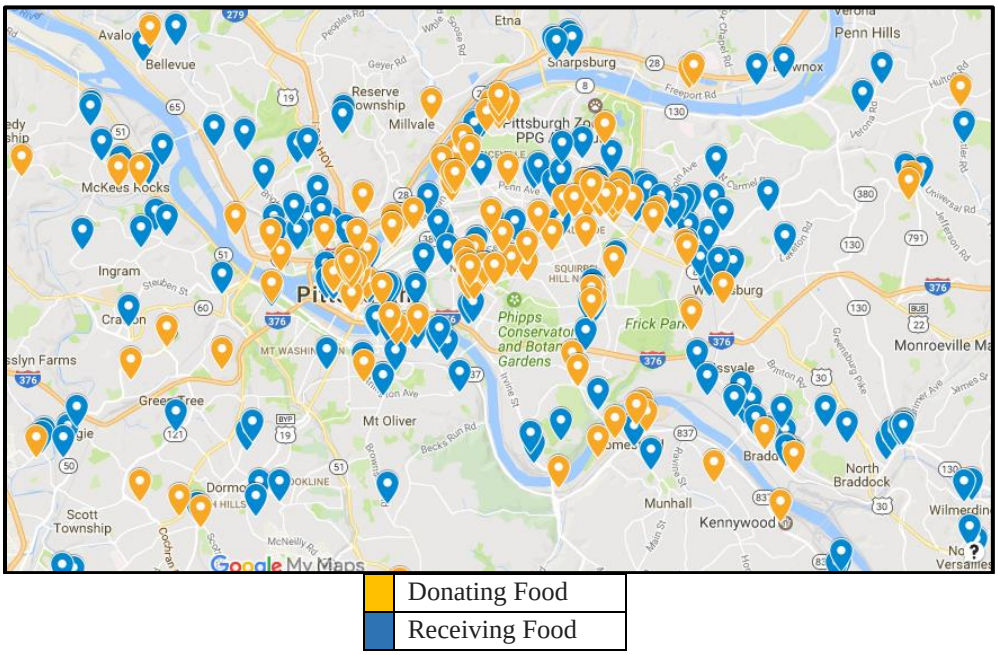

Figure 8. Map of 412 Food Rescue Donors and Partners

The benefits of the data collection via Google Forms and Sheets is that it is a free, open source, and easy to share across the organization. Google's software can also be easily used across almost any device. The drawbacks of this software are that as the organization grows, it will outgrow the spreadsheet capabilities of Google sheets. For this reason, future improvements should include a move to a database software that can optimally handle 412 Food Rescue's data.

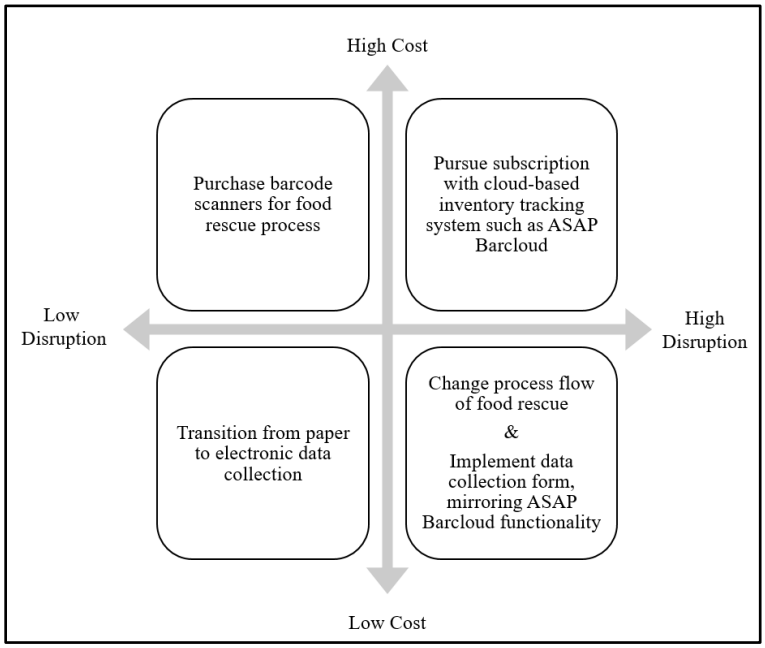

Figure 9: Solution Matrix

Reflection

In the fall of my senior year, I took the course called Social Entrepreneurship-Engineering for Humanity as a technical elective to fulfill one of my last few undergraduate requirements, and since I am actively involved in community service on campus, this class piqued my interest. The course discusses how engineers and entrepreneurs can be socially responsible in their work. The class was unlike any other engineering class I have taken before, filled with discussions and guest speakers. As mentioned before, one of those guest speakers happened to be Leah Lizarondo, the co-founder and CEO of 412 Food Rescue. After listening to Leah talk about the logistics of the organization, I noticed a common thread between the operations at 412 and my Industrial Engineering background. At the end of our class, Leah mentioned that if anyone was interested in working with 412 Food Rescue, they could reach out to her. I sent her an email, set up a meeting, and a service-learning project was born.

From a class discussion to an entire community-based research project, I never could have imagined that this project would result. My three biggest takeaways are project management, independent motivation, and community outreach communication.

First, project management was a huge part of this project since it developed from a class lecture. When I first heard about an opportunity to work with 412 Food Rescue last semester, I had many grandiose ideas about what that type of project would look like. I spoke with Leah Lizarondo, and shared that my interests were in data analytics, and she suggested that I consider the data collection and storage methods that 412 Food Rescue uses. However, as I started work I realized that there were more and more tasks that I could take on. In these instances, I had to remember what I should focus on and not be distracted by other goals. Learning to keep my work and focus within the scope of the project was a new experience, especially compared to the projects done for class assignments. Since assignments usually have clear checkpoints and requirements, it was easy to calibrate my work to meet the expectations required. However, with this project, I was the person creating the expectations.

Along with the scale of the project, service learning taught me how to manage my own time and how to prioritize work. This project is my first independent research, so I am used to working under a supervisor who can guide and steer me. Dr. Mena was tremendously helpful in guiding me throughout this process; however, she never explicitly gave me tasks to complete. She asked follow up questions and prompted me to decide my next step on my own. Independent research also helped me learn how to ask for help when needed and seek advice from others. Since I was the person in charge of scheduling meetings, observing, and completing data analysis, this project encouraged me to look at research from a different perspective. In my other research experience, I came on to the project midway, meaning that the scope and goals of the project were already formed. With this independent service learning project, I was the creator and executor of the entire project. With this new perspective, I gained a better understanding of the research project and a deeper appreciation for academic research.

Finally, this project helped me communicate effectively with outside organizations, particularly people who are not in the same field as me. During observations and throughout this project, I had to explain the goals of the project to people who were entirely unfamiliar with it. To address this, I had to ensure that I was a clear communicator and had a deep understanding of my own project so that I could speak passionately about it to others. For example, during the observations that I conducted in the 412 Food Rescue trucks, I had to introduce myself and the project, ask relevant questions, and complete observations. What was most important for me to

remember though in these observations was that I was the outsider. I was observing people who do this job every single day. I learned how to focus on being inquisitive and thoughtful in my communication since the people I was observing were the experts, not me.

This project falls right in line with the work that I do in my classes and the work that I intend to do full time. However, this project was very different in terms of the customer and organization that is being served. For me, this reinforced why engineering is so important in modern society. Engineers are the people who apply the cutting-edge solutions to the problems that few dare to solve. In the classroom, these projects tend to wrap themselves up in a nice bow. However, in real application they are not as neat. This project reminded me that it is okay for a project to feel incomplete at its ending. In fact, that is probably a good thing since there are always improvements to be made.

In the application process and the beginning of this project, I often felt empowered by being an engineering student tackling a community-based project. During our biweekly group meetings, though, I realized that outside of the engineering sphere, I had a lot to learn. We read and reacted to three different articles throughout the semester which were focused on service learning and social responsibility (Strand, Marullo, Cutforth, Stoecker, and Donohue 2003; Mitchell 2008; Hooks 1994). While reading and writing about these articles, I realized that my engineering education had not taught me how to think critically about these ideas.

In the first article we read, "Principles of Best Practices for Community-Based Research," the authors, Strand et. al (2003), discuss the most effective ways to approach service learning research projects. The sections of this paper that taught me the most were those about building relationships. In the engineering world, so much of my research is done in a lab or on computer software. While reading articles like these, I was both humbled by how much I had to learn and put off by its inaccessibility. One area I think could be improved upon is creating a better link for STEM students for community-based learning. Looking at the Accreditation Board for Engineering and Technology (ABET) guidelines for engineering curriculums, there is no requirement for community-focused learning ("Criteria for Accrediting Engineering Programs" 2017). ABET is the organization that colleges and universities must be accredited by to meet global engineering standards. ABET requires "a general education component that complements the technical content of the curriculum and is consistent with the program and institution objectives" ("Criteria for Accrediting Engineering Programs" 2017). With this framework, institutions can choose how they structure general education requirements for their students based on the values of the university itself. The University of Pittsburgh requires students to fulfill breadth and depth requirements with their six elective requirement courses, meaning that students must take courses from different subject areas and take at least two courses in the same subject ("General Education Requirements" 2017). Outside of these requirements, students can choose their social science and humanities classes. This flexibility means that students self-elect to take discussion-based classes—they are not required ("General Education Requirements" 2017). While this is a shortcoming in the engineering education, I believe it should also be kept in mind by service learning educators. To expect students in a service learning setting from the STEM field to be able to think critically about these issues and communicate their thoughts effectively with the community is asking them to operate in an entirely different environment than they are used to. In my experience this semester, I would have found an onboarding helpful so that students are familiar with the landscape they will be working in.

On the positive side of this, my engineering education was an asset to this project and to the discussions with other student researchers because it gave me a unique perspective. Since I tend to approach problems in a very scientific manner, this differed from how my community partner and my peers approached situations with a more qualitative and emotional side. When developing solutions, my engineering education also helped me frame them in terms of being reproducible and dynamic enough to respond to changes.

Additionally, this project reminded me that with my engineering education I have a responsibility to serve my community. The data and processes in this project are exactly like networks that I study in class. Supply chain, operations research, and facility management all apply here. However, this project changed the sponsor from a large corporation to a small non-profit. No matter the customer I am serving or the scale of the project, the engineering principles that I am applying do not change.

After this project, I am even more certain that I want to spend the rest of my life working to apply engineering concepts to the non-profit world.

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This project would not have been possible without the support of the University of Pittsburgh Honors College, Holly Hickling. Thank you to my two mentors, Dr. Irene Mena Lora and Leah Lizarondo. Thank you to Dr. Mena for being so open and inviting and encouraging me to pursue this project. Thank you to Leah for being so welcome to bringing a student on your team and for being a role model.

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Appendix – Time Data from Observations

Time of Event	Task	Time Elapsed (H:MM:SS)
12:05 pm	Depart from Millvale	
12:36 pm	Arrive at GFS in Imperial	0:31:00
12:40 pm	Begin loading truck	0:04:00
12:57 pm	Loading complete	0:17:00
1:02 pm	Call first stop	0:05:00
2:06 pm	Arrive at Site 1	1:04:00
2:34 pm	Finish at Site 1	0:28:00
2:36 pm	Arrive at Site 2	0:02:00
3:00 pm	Finish at Site 2	0:24:00
3:02 pm	Arrive at Site 3	0:02:00
3:26 pm	Finish at Site 3	0:24:00
3:30 pm	Arrive at Site 4	0:04:00
3:53 pm	Finish at Site 4	0:23:00
4:00 pm	Arrive at Site 5	0:07:00
4:12 pm	Finish at Site 5	0:12:00
4:38 pm	Arrive at Site 6	0:26:00
4:58 pm	Finish at Site 6	0:20:00
5:06 pm	Truck back to Millvale	0:08:00

Time of Event	Task	Time Elapsed (H:MM:SS)
7:55 am	Depart from Millvale	
8:20 am	Arrive at Trader Joes in South Hills	0:25:00
8:36 am	Depart from Trader Joes	0:16:00
8:50 am	Arrive at Site 1	0:14:00
9:10 am	Finish at Site 1	0:20:00
9:32 am	Arrive at Site 2	0:22:00
10:02 am	Finish at Site 2	0:30:00
10:13 am	Arrive at Site 3	0:11:00
10:36 am	Finish at Site 3	0:23:00
11:04 am	Return to 412 Food Rescue Office in East Liberty	0:28:00