Simulation of Volunteer Task Assignments as Characterized by Organizational Support Values

Vidyut Baskar

Rensselaer Polytechnic Institute

Abstract:

While many non-profit companies currently receive a good amount of help from volunteers, limited research has gone into helping companies keep those volunteers content and to continue volunteering. The aim of this study was to test how organizational support from the company may affect the willingness for a volunteer to stay. To complete this study, the project included the creation of a virtual simulation using the Arena Simulation Software based on the survey results from various non-profit organizations in the greater Puget Sound region. At the end of the simulation there were some clear and expected trends in the data. Data was collected by measuring the rate of depreciation in volunteers, the number of volunteers the company decided to support, as well as the total amount of jobs that got filled up each year. Overall, the simulation outputted a negative slope in each of these three graphs, as volunteers began to depart from the organization. These different measurements require more testing with other factors, although the impact of organizational support is exhibited in these trends. This simulation can be deemed useful with the inclusion of more factors, for organizations, in order to optimize the retention rate in employees and volunteers.

Introduction:

Through the past 20 years, the necessity of having stable non-profit organizations has increased vastly with the lack of volunteers. In order to keep these organizations running and stable there is a need for volunteers to get involved and help them serve their community. Although, it has recently been about the decrease in the total present volunteers. In 2015 the volunteer rate declined by 4% (Bureau of Labor Statistics, 2016). This is becoming a growing issue as many non-profit organizations are having to pay employees, which is not economically

viable in the long run. Recently the concept of organizational support has become a big factor in the decision for many volunteers to either join a company or return to a company. Organizational support is the degree to which employees (volunteers) believe that their organization values their contributions and cares about their well-being and fulfills socioemotional needs (Harkin & Lingo, 2019). Organizational support is known as the ability for an organization to create a positive dynamic within their employees, as employees have the tendency to perform better in order to receive rewards. With many volunteers, after having a bad experience or not liking the job they were assigned, tend to drift away because they no longer receive the same satisfaction in helping others. In order to figure out how to help these non-profit organizations, the necessity to find why people are tending to leave their volunteer jobs is key. The creation of a simulation to test different sets of demographics and test a trend of depreciation in volunteers in necessary. This is a feasible and cost-effective way of testing the different causes and effects of volunteers in non-profit organizations. The necessity for companies to realize this and be able to support and tend to their employees' basic needs is very important. There have been many situations like this in which a volunteer did not enjoy their line of work and decided to quit because of it. In order to attack this issue, people have speculated and created possible reasons as to why this may be occurring, but no actual statistical data has been captured that proves these speculations (Rilo, 2015). The goal of this engineering project is to create a simulation that uses an algorithm developed on non-profit surveys, which can result in an accurate representation of the retention of certain volunteers, as well as perceived reasons as to why this occurs. Throughout the creation of this simulation,

local non-profits were interviewed in order to ensure the accuracy of simulation. Data was also taken from online and public resources. After retrieving my data, it was put it into another program, called Project Analyzer which was able to generate graphs of my data as well as be able to compare my data with other similar studies. While my data is quantitative, the reasoning about why it received such numbers was not numerical. Because of this, the characteristics data was also compared among general research to come up with a possibility for the retrieved values.

The project at hand solely focuses on the creation of a volunteer retention-based simulation. This simulation is not a hands-on simulation and will only require a computer to run. For this reason, there were no real risk/safety concern for this project.

Engineering Goals

1. Create a simulation that uses an algorithm developed on non-profit surveys that can result in an accurate representation of the retention of certain volunteers, as well as perceived reasons
    - Turn survey data into quantitative algorithm
    - Online statistics
    - Account for outliers
    - Include what kind of non-profit
2. The simulation and simulation results will be relayed back to a handful of non-profits for them to compare against their personal background, seeing if this matched with their approximation
    - Accuracy check to get simulation as consistent as possible

- No quantitative way to test accuracy

3. Re-edit the simulation to make it as accurate as possible based on real life feedback.
    - As accurate as possible

Methods:

Procedure (Creating Non-Profit Surveys):

1. Gather lists of potential local non-profits that are contactable.
    a. Understand what each non-profit does and how many volunteers they may need
        i. Choose companies with similar volunteering needs
2. Generalize these companies into low preforming, medium preforming, and high preforming categories
    a. 3 companies for each category
    b. Performance is based on size of organization
3. Collect the contact information for each organization and place them into separate tables

Low

Non-Profit Organization	Contact Information
The Vera Project	jessicas@theveraproject.org
New Horizons	info@nhmin.org
Plymouth Housing	rsizemore@plymouthhousing.org

Medium

Non-Profit Organization	Contact Information
Orca Conservancy	orcaconservancy@gmail.com
Climate Solutions	https://www.climatesolutions.org/about-us/contact-us
Faith Trust Institute	training@faithtrustinstitute.org

High

Non-Profit Organization	Contact Information
Food Lifeline	https://foodlifeline.org/contact-us/
Hope Link	https://www.hopelink.org/contact

4. Create a general encompassing survey for all 3 categories which will account as your baseline responses

    a. Ensure that these questions can be answered by any organization regardless of company performance

Example General Survey:

A. In your opinion, would you regard your non-profit as small, medium, or large, in comparison to other organizations?

B. Does your non-profit currently have an issue with volunteer retention or the accessibility of volunteers?

    a. What could your company do with an increase of volunteers

    b. At this rate of volunteer depreciation do you believe your company will be sustainable without change

    c. Do you have any models or data about your volunteers, and specifically how you are able to get hold of them?

C. Would you say that you treat your volunteers well (organizational support)?

    a. What does this include (benefits)?

D. What are certain areas you believe you can better support your volunteers to increase retention

5. Contact these organizations and either meet with them in person, talk with them over the phone, or worst-case over email to record the results from the interviews
    a. During these interviews, be ready to adapt to responses of the organization
        i. May want to create a list of possible questions you may ask based on the situation

Procedure (Creating Simulation)

1. Based on the gathered information create a detailed algorithm, incorporating all the previous statistics and gained information from the non-profits. This will be the basis for the entire simulation so make it as accurate as possible.
    a. Will be created with in person survey results as well as statistics found on online databases
        i. Refer to *Figure 3* for researched statistics and assumptions used in simulation
    b. Process for making the algorithm
        i. Need to turn the data received from non-profits into numerical values
        ii. Understand the importance of this factor and create a multiplier (scalability) that will be the coefficient of this variable
        iii. Repeat this for every factor and multiply them together until the factors add up to 1
2. Gather a laptop/computer and download the student version of the Arena Simulation Software https://www.arenasimulation.com/academic/students
    a. Simulation creation software that allows users to create a simple model, with a simplistic UI. It is not based on a coding language but is in a block style format

allowing anyone to pick it up. The simulation software can get as complicated as you want as it has a cap of 150 attributes (number of blocks)

b. Limited capabilities

3. Learn the Arena Software API through the same website in the previous link
    a. Topics of Interest (Main Modules used):
        i. Decide Module
        ii. Station Module
        iii. Search Module
        iv. Route Module
        v. Assign Module
        vi. Process Module
        vii. Create Module
4. Create a flow chart of what you want your actual simulation to look like
    a. Make it as generic as possible so that you can more easily implement in any simulation software
    b. Start with the most important aspects and continuously expand with more ideas

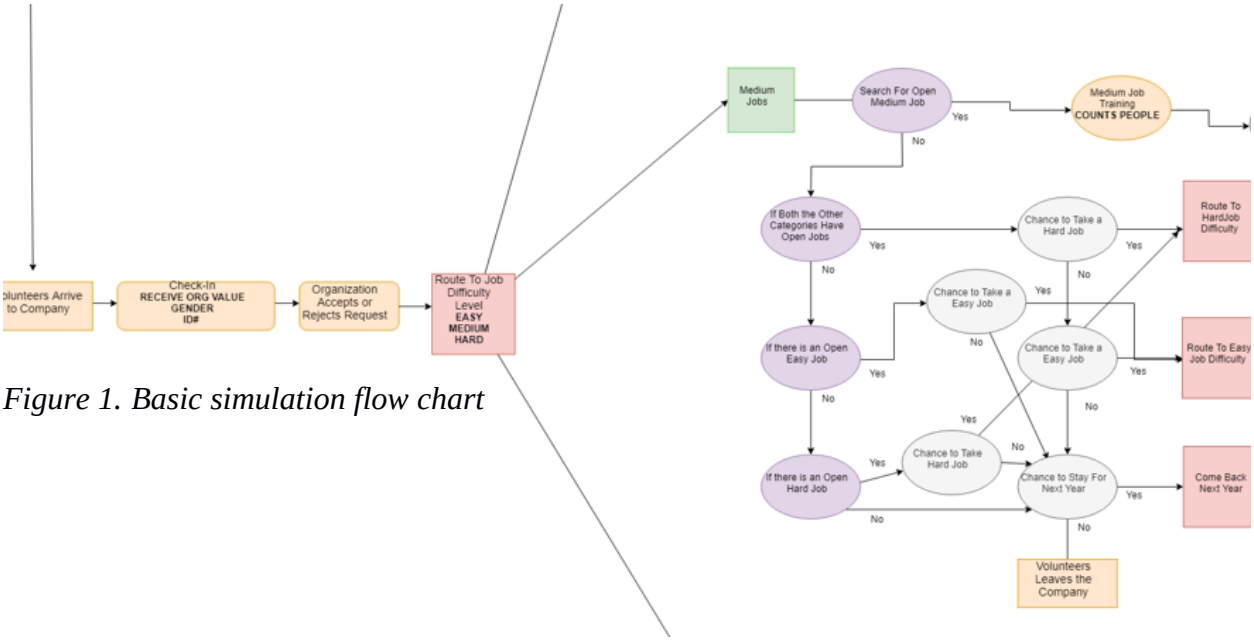

Figure 1. Basic simulation flow chart

5. Once you feel like your smaller flow chart is a feasible task, expand and build upon this

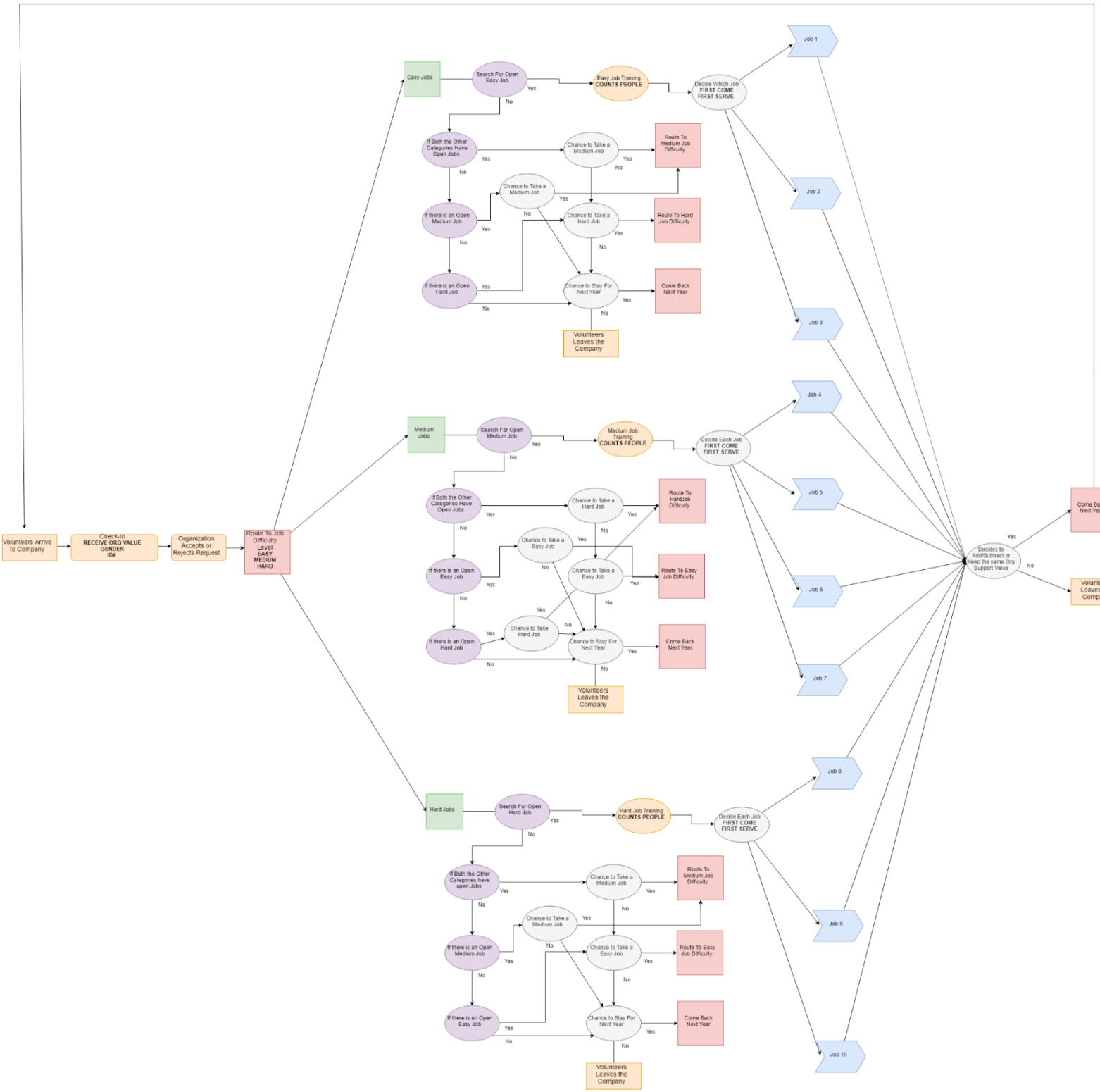

Figure 2. Completed Flow Chart

Procedure (Data Analysis):

1. Download a program called *Project Analyzer*
    a. This is an attachment on the Arena Simulation Software
2. Set the *Project Analyzer* to certain attributes you want to test for.
    a. Automatically create a graph with proper variables as well as a data table with the same variables
        i. Play around with different characteristics
3. Input your program file into the *Project Analyzer*
4. Run the program, and watch the graph get generate as the entities complete the simulation
5. Compare the received data against previously researched articles as well as non-profit interviews to formulate conclusion

	Scenario Properties				Controls						Responses	
	S	Name	Program File	Reps	Administrater	Num Reps	Easy Workspace	Medium Workspace	Hard Workspace	Rep Length	Volunteers.TotalTime	Company_Support Percent
1		Scenario 1	1 : RPI New.p	1	2.0000	1	3	4	3	1095.0000	125.014	0.300
2		Scenario 2	1 : RPI New.p	1	1.0000	1	3	4	3	1095.0000	125.015	0.300
3		Scenario 3	1 : RPI New.p	1	1.0000	1	3	4	3	1095.0000	125.015	0.300
4		Scenario 4	1 : RPI New.p	1	1.0000	1	3	3	3	1095.0000	392.986	0.500
5		Scenario 6	1 : RPI New.p	1	1.0000	1	3	2	3	1095.0000	457.649	0.800
7		Scenario 8	1 : RPI New.p	0	1.0000	1	3	4	3	1095.0000	---	---

Figure 3. Project Analyzer Scenario Data

Expected Outcomes:

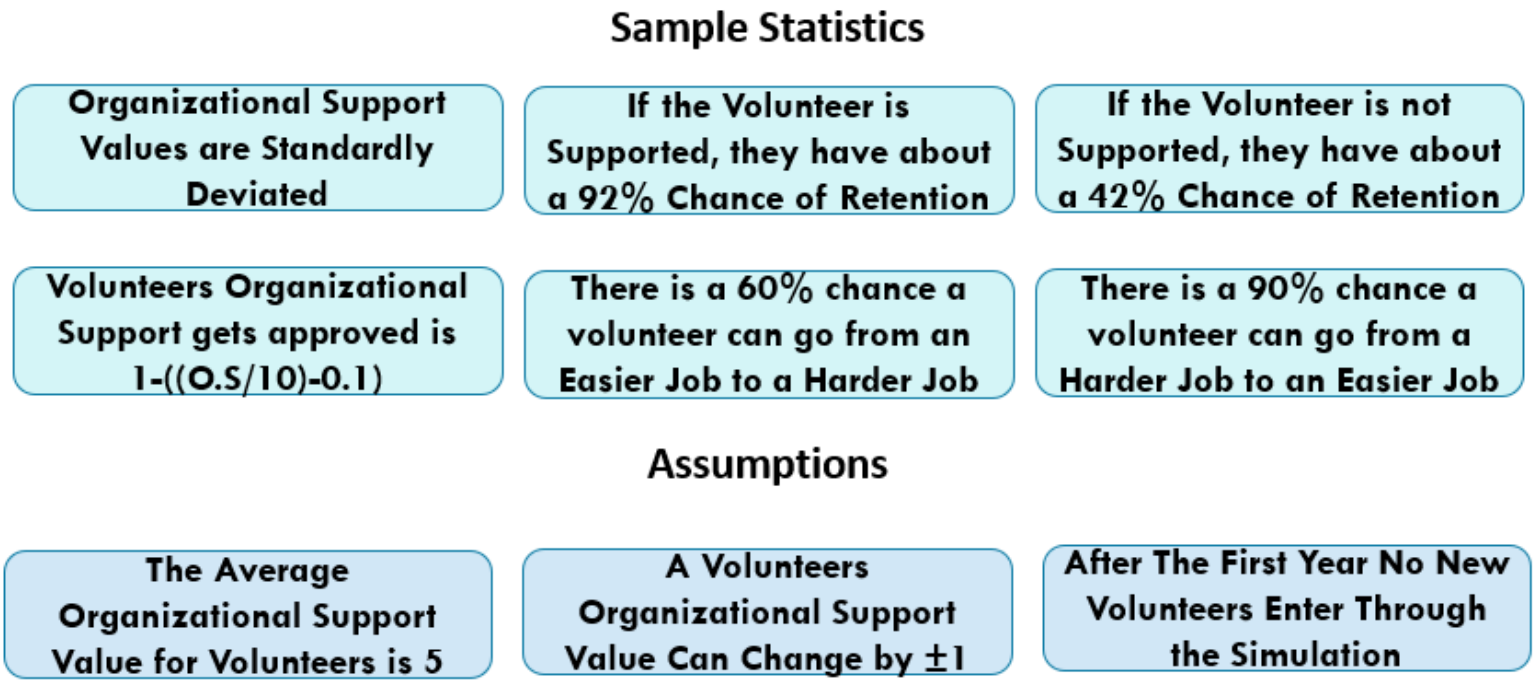

Figure 4. Researched Statistics/Assumptions

At the end of the simulation, the expectation is to see clear trends in the data. By collecting data about the rate of depreciation in volunteers, the amount of volunteers the company decided to support, as well as the total amount of jobs that got filled up each year, the simulation should output a negative slope in each of these three graphs (different years), as volunteers begin to depart from the organization.

For my characteristical traits, age and educational background will probably play the biggest role in the retention of volunteers. People that are older (past the age of retirement) will have a higher likleyhood of staying with a non-proft. If a persons education directly corresponds to thegoals of the non-profit, it should prompt them to stay compared to those that have not receieved that same education.

Data Tables:

Volunteer Depreciation Over Three Years

Trial #1	
	Number of Volunteers Remaining In Company
Year 1	**20**
Year 2	**15**
Year 3	**10**

Trial #2	
	Number of Volunteers Remaining In Company
Year 1	**20**
Year 2	**13**
Year 3	**9**

Trial #3	
	Number of Volunteers Remaining In Company
Year 1	**20**
Year 2	**12**
Year 3	**6**

Number of Jobs Completed Per Difficulty Categorey Each Year (Avg)

	Easy Jobs	**Medium Jobs**	**Hard Jobs**
Year 1	**3**	**4**	**3**
Year 2	**3**	**4**	**3**
Year 3	**2**	**3.33**	**2.8**

Number of Volunteer's Organizational Support Accepted/Rejected Per Year (Avg)

	Number of Accepted Volunteers	**Number of Rejected Volunteers**
Year 1	**10.33**	**9.66**
Year 2	**6.66**	**5**
Year 3	**5.33**	**3**

Data Analysis:

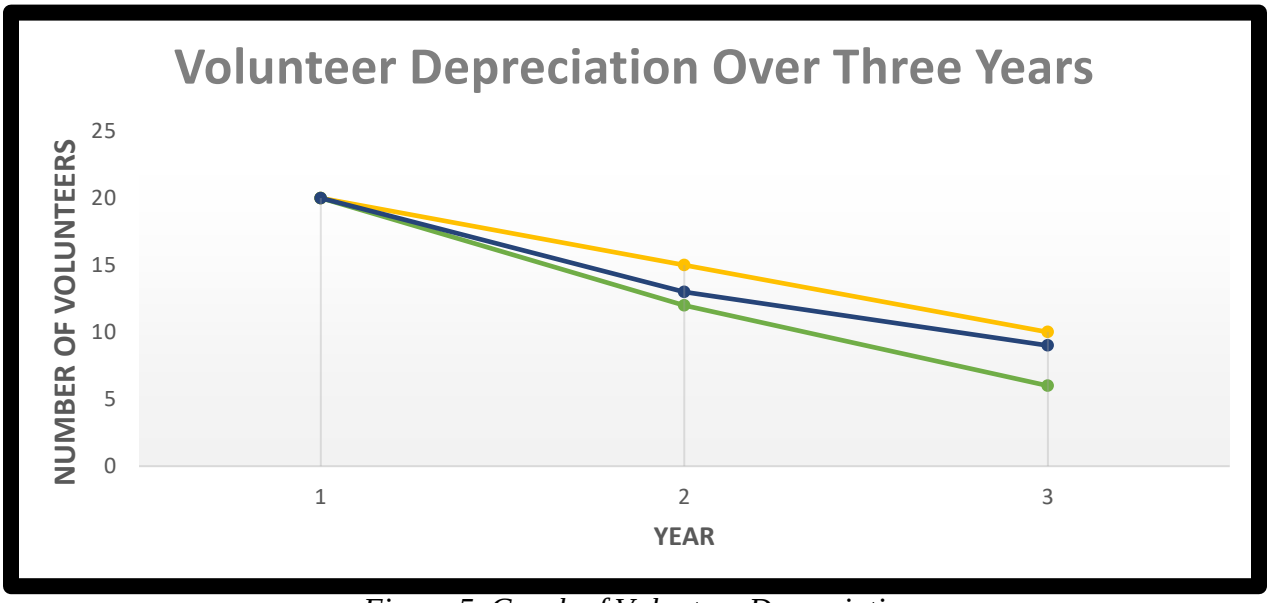

Figure 5. Graph of Volunteer Depreciation

The line plot above shows consistent data across the three trials of the simulation describing the volunteer rate of depreciation. As years pass, the amount of volunteers in the company decrease at a relative linear rate. Through 100 runs of this simulation there was an average rate of depreciation of 5.3 volunteers per year.

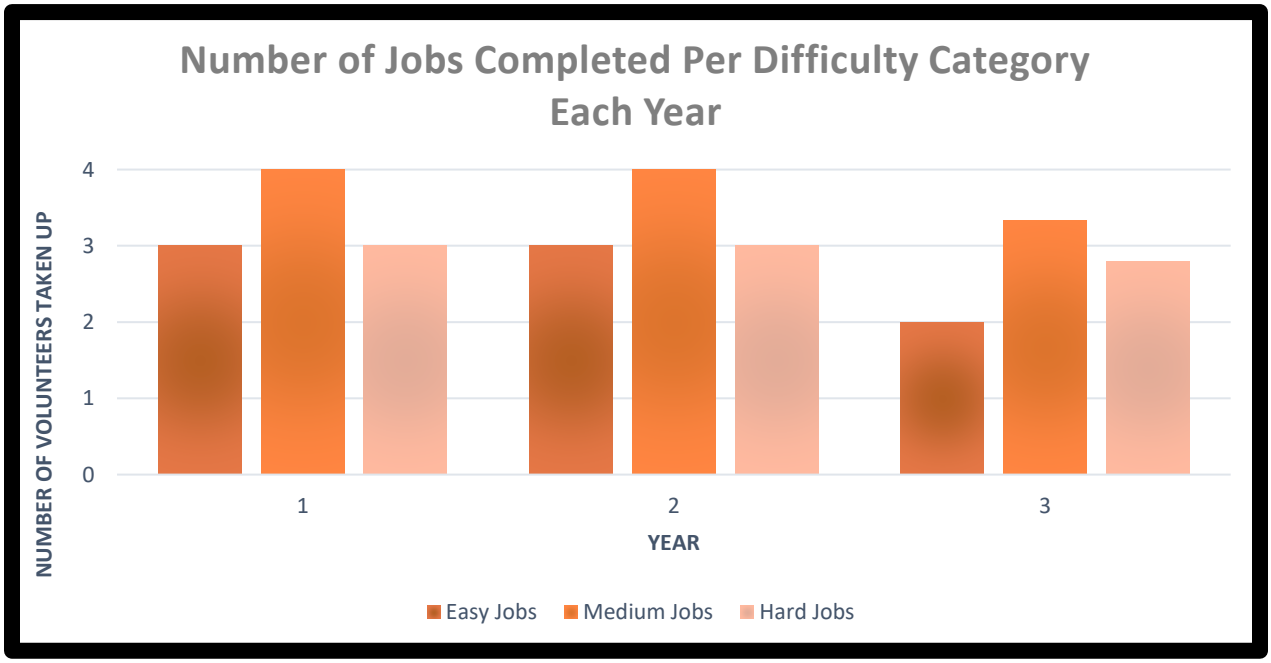

Figure 6. Graph of Job Distribution Over Three Years

The bar graph above shows the average number of jobs completed in each difficulty category per year. In the first two years of the simulation on average all of the jobs get completed. However, when the simulation reaches the third year the average amount of volunteers per jobs tend to decrease, especially for the easy difficulty.

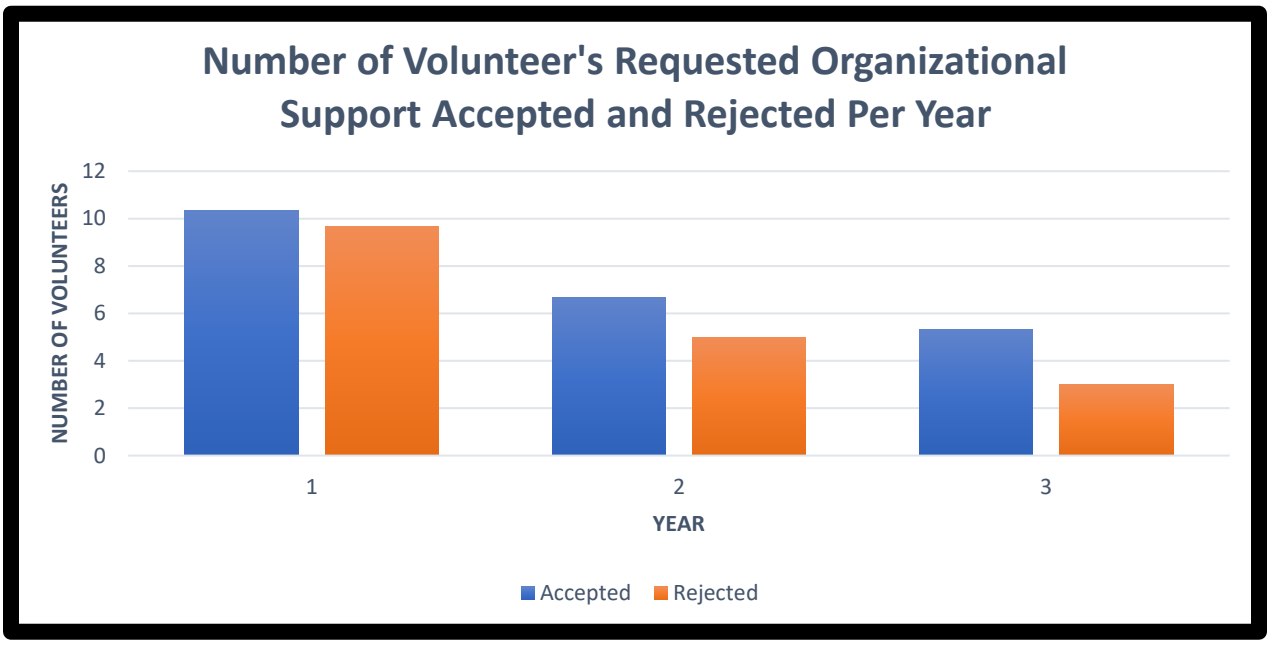

Figure 7. Graph of Volunteer's Organizational Support Values Accepted and Rejected

The bar graph above shows the average number of volunteers that got their organizational support needs accepted and rejected. Over the years as the amount of volunteers decline in the company the number of acceptances decline, as well. Over all three years of the simulation, on average, the amount of volunteers that were accepted was more than those that were rejected.

Conclusion:

There was a steady depreciation in volunteers after the end of each simulation

- At the end of the third year there was an average of 8.33 volunteers left in the program. In my simulation, with a total of 10 jobs , there wouldn't have been enough volunteers to complete the jobs
- Between the first and second year, there was an average loss of 6.66 volunteers, while between the second and third year there was only a loss of 5 volunteers. If the program were to be run for multiple more years, the graph would begin to resemble an exponential curve as there are less volunteers available to leave the program.

During the first two years of the simulation, all the jobs were able to be completed, although some jobs in the third year were not able to be completed

- The easy jobs had the lowest total job completion rate with an average of 1 less job being completed in the third year of the company. Generally a company would have to bring in either an employee to completed the designated task or they'd be forced to search for a new volunteer for the year.

Through the three-year time span the amount of volunteers that got their organizational support value approved turned out to be more than those that got rejected.

- As the years progressed, the difference in accepted to rejected tended to increase. The volunteers with a lower organizational support value tended to enjoy and stay

> with the company, which is why there were more getting accept later on compared to the early years.

The received results sharply agreed witht the expected outcomes, with clear downward slopes in each graph. "*The simulation should output a negative slope in each of these three graphs (different years), as volunteers begin to depart from the organization*".

In the future, I would plan to add more restrictions to the simulation. Currently the only factor considered is the organizational support value, while there are other factors in the retention aspect such as group integration, empowerment, and participation of employees. Another aspect that would make my simulation more accurate is that I could include a random factor into my simulation with the chance of a new volunteer joining every year. On top of this, I hope to incorporate my simulation into the full-access version of the software. With the current software, I couldn't get all the data I hoped to gain as it was a free student version which didn't allow access to all the features.

Bibliography:

Arena Simulation Software. (9AD, August). Retrieved November 8, 19AD, from https://ieeexplore.ieee.org/abstract/document/478785.

Beirne, C., & Lambin, X. (2013, April 8). Understanding the Determinants of Volunteer Retention Through Capture-Recapture Analysis: Answering Social Science Questions Using a Wildlife Ecology Toolkit. Retrieved November 8, 2019, from https://conbio.onlinelibrary.wiley.com/doi/full/10.1111/conl.12023.

Cuskelly, G., Taylor, T., Hoye, R., & Darcy, S. (2008, August 21). Volunteer Management Practices and Volunteer Retention: A Human Resource Management Approach. Retrieved from https://www.sciencedirect.com/science/article/abs/pii/S1441352306700237.

Establishing a Safe Container for Learning in Simulation:... : Simulation in Healthcare. (7AD, March 18). Retrieved September 22, 19AD, from https://journals.lww.com/simulationinhealthcare/pages/articleviewer.aspx?year=2014&issue=12000&article=00002&type=Fulltext.

Finkelstein, & A., M. (1970, January 1). VOLUNTEER SATISFACTION AND VOLUNTEER ACTION: A FUNCTIONAL APPROACH. Retrieved from https://www.ingentaconnect.com/content/sbp/sbp/2008/00000036/00000001/art00002.

Kadakia, S. C., Angueira, C. E., Ward, J. A., & Moore, M. (2005, October 17). Gastrointestinal endoscopy in patients taking antiplatelet agents and anticoagulants: survey of ASGE members. Retrieved from https://www.sciencedirect.com/science/article/abs/pii/S0016510796701700.

Lawler, E. E., & Porter, L. W. (2008, May 1). The Effect of Performance on Job Satisfaction. Retrieved November 8, 2019, from https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1468-232X.1967.tb01060.x.

Reciprocation of perceived organizational support. (n.d.). Retrieved November 8, 2019, from https://psycnet.apa.org/buy/2001-16970-004.

Rotolo, T., & Wilson, J. (2014, June 2). Social Heterogeneity and Volunteering in U.S. Cities. Retrieved November 8, 2019, from https://onlinelibrary.wiley.com/doi/full/10.1111/socf.12091?casa_token=FHngnwqDNu4AAAAA:JnQ5EaUJ4j8A0YVoDphGoSA1DCzpQg8gmWznjG56Qnu11UENJu-DckgGfjbVuC16vBt5n9m84KGOpdCZ.

State Rankings by Volunteer Retention Rate. (n.d.). Retrieved from https://www.nationalservice.gov/vcla/state-rankings-volunteer-retention-rate.

Total quality management and performance. (n.d.). Retrieved from https://www.emerald.com/insight/content/doi/10.1108/02656710710757808/full/html

Volunteer retention in community sport organisations. (n.d.). Retrieved from https://www.tandfonline.com/doi/abs/10.1080/16184740408737469.