

Piedmont Master Gardeners Help Desk Ticketing and Wiki System

Nathan George
University of Virginia
ntg9vz@virginia.edu

Sam Prescott
University of Virginia
sbp9as@virginia.edu

Lawson Kennan
University of Virginia
lck8bq@virginia.edu

Matthew Schaeffer
University of Virginia
mbs5mz@virginia.edu

Jack Lint
University of Virginia
jrl2ek@virginia.edu

John Valeiras
University of Virginia
jdv3hn@virginia.edu

Karley Walker
University of Virginia
kbw2as@virginia.edu

ABSTRACT

The Piedmont Master Gardeners is a local nonprofit organization that works with the citizens of Charlottesville, Albemarle County, as well as surrounding counties on any of their horticultural needs. They rely on the volunteering of dozens of Master Gardener Volunteers in order to make their operation work. The main way that they help citizens is by answering questions or holding events at local markets. The current system that they are is a paper based ticketing system which means that their whole operation is completely manual. As more questions come in this has created an excess amount of time to be spent on filing and keeping track of old tickets in order to use these tickets to help answer future questions. Thus our Service Learning Practicum group developed a web application for the Piedmont Master Gardeners to help better store and keep track of their precious information. This system was developed using the Python Django Framework, and should create an easier more streamline system for the Master Gardeners.

1 INTRODUCTION

The Piedmont Master Gardeners is a nonprofit organization of over 150 volunteers in Charlottesville and Albemarle County. The volunteers function as educators and horticultural enthusiasts within the community, answering questions and providing best-practices for gardening and landscape management. The Piedmont Master Gardeners work in partnership with the Virginia Cooperative

Extension and Virginia Tech to give communities within Central Virginia research-based information [3].

The Master Gardeners not only provide general help and provide resources for the community, they also train volunteers vis the Cooperative Extension all over the country. These volunteers have a wealth of knowledge for answering a broad range of gardening, landscaping, and horticultural questions, leading community events such as farmers markets and gardening workshops, and diagnosing plant and pest infestations [3].

The organization has grown larger over the years as the Cooperative Extension has expanded to all fifty states and increasingly gains volunteers. As an organization, their primary clerical tasks are running the Help Desk, which can include gathering plant and pest samples from community members and sending them to a lab to be diagnosed, and attending/organizing events. The Help Desk is stationed by at least one Master Gardener who fields the question, responds if they can, and logs the encounter. This process is currently done on paper and is stored in a backlog of binders. This process was slow, messy, and difficult to edit. Demographics from walk-ins at the help desk and at events had to be hand counted and often led to great miscalculations. These demographics calculations are immensely important to the Master Gardeners as it determines their funding from the State [3].

This new system will be beneficial because it digitalizes the whole process and helps remove the possibility of human error. The Help Desk

form for a new ticket has been automated, making certain fields required and preventing errors related to bad handwriting and unintentional negligence. The ticket form is also editable, allowing the Master Gardeners to update the ticket as they get more information regarding the question or a sample that may have been sent to the lab. We have given them a smooth interface that will allow users of all experience levels to easily and completely fill out the form. The same can be said for events. By digitalizing the event form and demographics form, we can return accurate data about the number of volunteers working per shift and proper demographics data they can report to the State for funding. Again, we have given them an easy form for quickly filling out demographics information while working the event, as well as an informative and clean display for viewing the collected demographics. Additionally, we have provided the Master Gardeners with additional features such as a news page, admin page, and editable Wiki. The news page will allow the Master Gardeners to keep each other up to date with current news and events. The admin page allows select Master Gardeners to update specific categories within the ticket form. The Wiki functions as a standard wikipedia, storing a collection of information about any specific topic. So any volunteer could edit the wiki about a specific plant, bug, etc. with comprehensive information from related tickets, published research, or personal experience.

2 BACKGROUND

This web system was developed using the Django web framework. Django was used due to its ease of use as a high level python web framework. Django uses a slight twist to the common Model-View-Controller web framework, as they use Model-Template-View. Where the models are how the data is organized, the templates are the pages which display information, and the views are which data and how the data gets displayed on the page.

After developing this system locally the system was then deployed on to Amazon Web Services. AWS is an excellent service to host a system such as the Piedmont Master Gardeners' system as it has a free tier of database storage which is of good use for this sized system. The data that the Gardeners will be storing is almost entirely text based, with the occasional image or PDF file attached to the tickets. As such, the disk

usage of the Gardeners' system will be minimal, despite the fact that they will be using it daily to create and read tickets. AWS operates on a usage based payment plan, providing a very cheap, reliable option that meets the Gardeners' needs. As the Gardeners continue to use the system after our group has completed the Service Learning Practicum course, AWS will seamlessly scale to meet their larger database needs.

3 RELATED WORK

While there are many software solutions for creating and managing customer support tickets, none met the requirements of the Piedmont Master Gardeners, specifically their need to collect and report custom demographic information from the support tickets. This demographic information is required for state and federal funding. Existing systems were either too generic or too costly to purchase and maintain.

An example of such an existing system is Zendesk. Zendesk Support is a system for tracking, prioritizing, and solving customer support tickets. This software solution allows users to create multiple custom support request forms that show a unique set of ticket fields, which would allow PMG volunteers to know what kind of support their clients need. Zendesk also has solutions for a knowledge base called Guide. This would allow PMG volunteers to gather information as tickets are resolved and develop standardized solutions to common gardening questions. This additional functionality is an added cost, however [4].

While Zendesk provided the required functionality, its cost was too high. Custom ticket forms and custom demographic reporting (if possible) would result in costs in excess of \$200 per user, per month. This would mean an annual cost of over \$100,000.

An open-source example of an existing system is BioStars. BioStars is an open-source Python/Django-based question and answer software framework. BioStars is developed by scientists for scientists, and it aims to address the requirements and needs that scientific communities have. What made BioStars attractive was its ability to manage and prioritize questions, rank answers, and pull emails and import previous posts via email [1]. Email

integration was explicitly listed by PMG as a desired functionality.

We investigated BioStars as a potential software solution early in the fall semester; however, it became clear that such a solution would be too generic and did not meet the needs of the Piedmont Master Gardeners. Specifically, BioStars provided no functionality for custom ticket forms.

Our system addressed these concerns by providing the necessary functionality at minimal cost. Our system includes custom ticket forms that collect exactly the required information in a simple, easy-to-read format. It also provides a simple wiki system that can be used to keep track of common questions and answers. Our system also integrates email functionality that can be used to generate tickets automatically from emails. Finally, and most importantly, our system tracks required demographic and can generate demographics reports that PMG will use for funding purposes.

4 SYSTEM DESIGN

4.1 General Overview

The main purpose of the Piedmont Master Gardeners Help Desk System is to allow volunteers to easily create, store, and manage tickets that come into the Help Desk. These tickets contain questions asked by clients and are generated any time a client calls, emails, or physically visits the Help Desk. The Ticketing System allows for creation, editing, and deletion of Help Desk tickets. As each ticket deals with a community client, demographic information is collected from tickets, as well as from events the Piedmont Master Gardeners hold around Charlottesville. To aid the answering of tickets, volunteers also have access to a Wiki System that allows creation of articles on common horticultural questions. Similarly, a PMG News System exists for volunteers to post announcements. Finally, the Piedmont Master Gardeners Help Desk System allows for searching, categorizing, and exporting data. Combined, these software systems allow the Piedmont Master Gardeners to more effectively serve the Charlottesville community on horticultural matters [2].

4.2 Ticket System

The Ticketing System is the core component of the Piedmont Master Gardeners Help Desk System. Upon visiting the system site, the homepage displays all currently open tickets in order of the date each ticket was created. In addition, the name of the client, method of contact, information about the problem, length of time open, and notes to the next shift regarding each individual ticket is displayed. Tickets on the homepage can also be sorted by these fields in order to organize data. Finally, the homepage allows volunteers to be logged for a given day. Volunteers are associated with a shift on a given day. As a result, any ticket that is created during a volunteer's shift will be associated with the logged volunteers. The homepage also provides links for navigation to other portions of the system.

The ticketing index allows for the creation, updating, and deletion of all tickets regardless of status. All tickets in the system are displayed on the ticket index and color coded by their status, which can either be open or closed. Tickets are displayed in a similar fashion as on the site homepage. The ticket index provides links for ticket creation, detailed information, and editing of existing tickets.

Ticket creation functionality was modeled heavily after the series of paper forms the Piedmont Master Gardeners use. The information and process flow is meant to be familiar to volunteers. Creating a ticket requires information about the incoming client, details about the ticketed problem, and on a conditional basis, demographic information about the client. Only the essential fields necessary for a valid ticket are required, giving volunteers flexibility in the amount of detail they provide when creating a ticket. Upon creating a new ticket, the user is redirected to the ticket index page.

Selecting individual tickets from the ticket index displays a detailed page for the given ticket. All information regarding the specific ticket is displayed, in addition to the names of the volunteers who were logged during the creation of the ticket. Two options exist on the ticket detail page: editing and deletion of tickets. Deletion is simple, and upon confirmation redirects the user to the ticket index. Deletion ensures all information about the deleted ticket is removed from the site. In addition, tickets can be edited. The edit form is identical to the creation form, but is pre-populated by the existing information. For whatever reason, any

information regarding a ticket can be changed and updated.

The system also allows for seamless integration with emails. A ticket can be created simply by providing an email address and an application password for a Gmail account from which to pull unread emails from. This feature will then create a new ticket for each unread email in the address's inbox, providing proper available client information and filling in the problem description and other fields using the subject and body of the email message. The function will then mark the emails as "read" in the user's inbox.

4.3 Wiki System

To aid in volunteers' efforts in answering community horticultural questions through the Ticketing System, a Wiki exists to allow volunteers to create articles on common topics. The Wiki is a simple, supplemental system to allow volunteers to more easily answer questions. The Wiki displays and orders all available articles by which articles have been updated most recently. In addition, Wiki articles can be searched from the main Wiki page. The content and title of an article are indexed to be searched. From the main Wiki page, a new Wiki article can be created.

Creating a new article presents the user with a simple form. The author, title, and body are all required elements of a Wiki article. In addition, volunteers can attach a photo to their Wiki article to be displayed in the article text. Finally, up to three tickets from the Ticketing System can be attached to a given Wiki article. A Wiki article topic may deal with content already addressed by existing tickets. Attaching tickets to Wiki articles allows for easy access of related information by volunteers when answering community questions.

4.4 Demographics

Piedmont Master Gardeners report their quarterly demographics to both the government and to Virginia Tech. They must record all clients who are either walk-in clients or clients who they helped at events. It is also required that they have both a raw count of the number of clients helped as well as a weighted count where each client who is helped is multiplied by the number of people working that day in the

help desk or that shift of the event where the client was helped. In order to implement this requirement into the system, we added places the ability to add demographic information in the ticket creation section when walk-in is selected and a place to add demographic information about someone served at a given shift for an event. It is also important to note that all of the demographic information is anonymous and is not linked to anything other than a given date or event.

In the system, in order to view the demographic information, the user must select the dates they wish to view the data from. They will then be displayed the four tables that they need for reporting which include demographics count, weighted demographics, client location count, and contacted by count.

4.5 Other

While the system's main components are the Ticketing System, Wiki System, and Demographics, there are other parts of the system that are pivotal as well. Firstly that would be the news section of the site which is designed to be used as somewhat of a bulletin board for the users of the system. This part of the system can be updated and changed as needed so that managers of the Piedmont Master Gardeners will be able to leave updated general messages for the team that may be using the system. All messages that are left on the News section will be visible to the team and will be sorted in order of most recently edited, such that users are alerted to changes in current news.

The Piedmont Master Gardeners organize events within the community, like hosting booths at Farmers Markets and holding gardening classes. As a state-funded non-profit, the Piedmont Master Gardeners must track the number of clients who come to the events and their demographics. To aid them, we created an event page. This page allows the Gardeners to make an event with information like the date, name, program coordinator, etc. Within the event, volunteers can work in shifts, so we allowed tracking the number of volunteers by the shift that they worked. While at the event, or even retroactively, the volunteers can enter the demographic data of clients who stop by. Often at events, the Gardeners are using tablets, so we made the form for event demographics very

mobile friendly. The Gardeners also have to enter the demographics of clients very quickly, so we gave them the option of “Save and Add Another” after entering the client demographics to save the information and clear the form so they can enter the next client’s information. This information is critical because the Piedmont Master Gardeners submit their demographics for funding purposes, and they get their biggest in-person client numbers at events.

As one of the key sections, as touched on earlier, the Ticketing System allows individual tickets to be sorted by targets, causes, and solutions. The tickets can be given a target, cause, and solution from a predefined list of each of them. Yet while the predefined lists are currently exhaustive, the Piedmont Master Gardeners team does wish to be able to update these lists in the future. This functionality is given through an admin tab which allows for the addition or deletion of targets, causes, or solutions.

The last of main functionalities of this site is the ability for the system to be able to search. One of the main uses of search will be to be able to search through old tickets and help solve or update current tickets. This feature will hopefully give the users of the system more time, as searching through old tickets should be easy, fast and seamless. The system additionally holds an advanced search feature which operates very similar to the regular search functionality but allows for additional filtering. This additional filtering will be done by giving the users of the site the ability to filter on one of more of the targets, causes, and or solutions.

4.6 Design Decisions

The system was designed to be intentionally straightforward and simple. Our clients are primarily middle-aged up to senior-citizen age range, some of whom are vocally against computers. To accommodate this, we mirrored their existing paper system as much as possible to make the transition as easy as possible. We kept the interface very clean and simplistic. Primary navigation is in the nav bar, and at the bottom of form pages is a redirect to the form index page. Buttons are all large, and the verbiage on them is clear and instructive. The general font size is slightly larger than normal to accommodate users who are visually impaired. One of our primary design decision conflicts was

in regard to uploading files and images in tickets, news, and wiki. Django makes multi-file upload more complicated than our users would like, so we made it a separate cleaner process. If the user wants to attach an image or document to a ticket, news article, or wiki article, then they must do so after they have created the ticket or article. This redirects the user to a separate upload page which allows them to upload multiple documents, as well as view the previously uploaded documents.

One critical design decision was to only have a single user, meaning that all of the Master Gardeners would share a login. This allows them to log into the system and just track the volunteers who are working that day, versus the volunteers needing to constantly log in and out of the system. We originally had separate logins for each volunteer and the capability to create new users, but the Master Gardeners have one primary desktop computer at the help desk that the volunteers all simultaneously share. The log-in just prevents non-PMG users from accessing the system.

5 RESULTS

5.1 Workflow

This system has significantly improved the workflow and process for the Piedmont Master Gardeners. This system has allowed the Master Gardeners to transform what had been a hard copy paper filing system into a completely automated online system that stores all their needed information, saving them 5 minutes per ticket, and making it far more accessible and organized. Now, instead of having to flag a ticket as open with a specially colored sticky note that might fall off in a cramped binder, their new system can easily display the tickets that are currently open and allow the team to dive into solving clients’ issues 5 minutes faster than before. The system also allows for multiple volunteers to work on a ticket simultaneously. Before, only one volunteer could work on a particular ticket because there was just one copy. Now it is all accessible on the web, potentially tripling worker production.

5.2 Demographics

One of the greatest reductions in time for the site users is that the site auto generates the demographics statistics for the Master

Gardeners. This process of gathering and reporting demographics is of vital importance because it's their only method of receiving government funding. This tallying process used to be done completely by hand, but is now fully automated, reducing human error and increasing the amount of free time to spend on other tasks. The end-of-quarter calculations would take hours to organize and figure out; oftentimes, the paperwork was lost. The automation of this process has saved PMG on average 1 hour per event, 5 minutes per client, and 10 hours or more per fiscal quarter. Before the automation of the demographics, the Master Gardeners would have to provide a separate form from the ticket information and keep it filed away anonymously, separate from all the other data, and then look back at the end of the quarter to count up all of the demographics and multiply each one individually by the number of volunteers that had worked during that specific shift. Now, all of it is automated and completed at the time the forms are filled out.

5.3 Databases and Search

The ability to search through old tickets and events has also saved PMG many hours of work. Organizing a paper file system chronologically was tedious and many of the volunteers didn't respect the system. Now, all of the tickets and events are kept in a single searchable database, saving at least 20 minutes of searching per ticket, and exponentially more time for older tickets that would be undoubtedly lost to obscurity. The Master Gardeners can now find tickets that they had even forgotten about, providing much needed answers to questions they receive.

Creating a wiki has also helped to organize these answers and information. Previously they had encyclopedias that only had tangentially pertinent information. With access to the wiki that we've created, volunteers can provide more relevant information about topics, saving the need to call the Virginia Tech labs and thus saving 3 business days or more of time that would be lost to bureaucracy.

6 CONCLUSION

This system has made the Help Desk for the Piedmont Master Gardeners significantly easier and more reliable. Where previously the

Gardeners needed to rely on paper tickets stored in binders, they can now easily and reliably input and store their data online. Client problems can be quickly formulated, analyzed, and acted upon without the fear of misplacing or destroying a paper ticket. PDFs, images, spreadsheets, and other relevant files can be attached to tickets as well, increasing their organization and therefore productivity. Our system also allows them to quickly search, sort, and organize their tickets so that they can spend less time shuffling through paper and more time working on real world problems. The wiki system that we implemented also aids the Gardeners' Help Desk staff by allowing them to create their own knowledge base that can easily transmit information about specific plants, customers, diseases, pests, etc. between help desk shifts, and help future staff that may run into similar problems if the problem had already been solved by someone at the help desk in the past.

In addition to our system saving time for the Gardeners working at the help desk, our system also automatically tallies and reports demographics for the Gardeners based upon the demographics as reported on the tickets. As the Gardeners are a nonprofit organization, they need to report information to the government on the demographics of the members of the community that they serve. Prior to our system, the Gardeners needed to sift through each ticket that was written up over the previous quarter and tally the age, sex, race, and place of residence for all clients served. Demographics data also needs to be gathered and reported to Virginia Tech, but the calculations for these data are different than those for the governments report. Our system does both of these calculations automatically. Reports are tallied in real time for the current quarter, and any previous quarter's data can be generated with the push of a button. This eliminates all need for tedious counting and also eliminates the possibility of human error when tallying or performing arithmetic on data.

6.1 Future work

There were several features that we discussed with the Gardeners that we had either changed or omitted from our final project in the interest of time. One feature that the Gardeners would like to add in the future is the ability to upload large amounts of tickets at a time through excel spreadsheets. Related to this, one feature that

we and the Gardeners agreed needed to be omitted was the ability to export ticket and demographic data to spreadsheets so that data could easily be shared through other media. Additionally, the Gardeners would like to expand the functionality of volunteers on the site to make it easier for them to input tickets that were handled in the past -- as it currently stands, volunteers must be manually added to tickets that are not entered for the current day. Currently, in our database structure, tickets are associated with days and volunteers are associated with tickets. Implementing this feature would require us to shift our database structure to associate volunteers with days alongside tickets, and then gather data about the particular day in order to calculate demographic information.

6.2 Acknowledgments

This project was completed with the help and direction of Dolly Feldman, Scott Boven, Penny Fenner-Crisp, and the other Master Gardeners.

REFERENCES

- [1] Biostar Central. Retrieved from <http://biostar-central.readthedocs.io/en/latest/>
- [2] Aaron Bloomfield. 2017. SLP Requirements Document – Piedmont Master Gardeners. (August 2017). Retrieved August 31, 2017 from <https://github.com/uva-slp/gardeners/blob/master/docs/Requirements.md>
- [3] Piedmont Master Gardeners. 2017. Retrieved March 31, 2017 from <http://piedmontmastergardeners.org/>
- [4] Zendesk Support. Retrieved from: <https://www.zendesk.com/support>