Draft Report

Client: Lindsay Jones - Virginia Discovery Museum

DRAFT REPORT:

Volunteer Volume Problem Statement

Project:

Creating a volunteer management application for the Virginia Discovery Museum

Prepared for:

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List of Acronyms

VDM	Virginia Discovery Museum
SQL	Structured Query Language
HTML	Hypertext Markup Language

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Executive Summary

[The executive summary is a complete summary of the project and should not exceed one page. It is best written last and should have a cohesive narrative including the methodology, findings, and conclusions]

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1. Introduction

1.1 Client Problem

[Should briefly state the client problem in approximately 1 paragraph]

**Problem straight out of document: "We have a wonderful roster of volunteers at the museum. All sign up through our Marketing & Outreach Manager and must communicate with her regarding shifts and duties. All volunteers much also log their hours via paper timesheets. It would be great to come up with a way to maintain the volunteer database and hours online that is user friendly for volunteers of all ages. Software. (6-8 team max)"

1.2 Objectives and Approach

[Should briefly describe the objective and approach to this project]

1.3 Report Organization

[Should briefly describe how the report is organized and a 1-2 sentence summary for each chapter to help the reader navigate to any specific areas]

2. Problem Definition and Background

Chapter 2 discusses the process of interviewing the client, understanding the background literature for this project, creating a problem definition, and considering the sociotechnical considerations of this problem. The client was Lindsay Jones at the Virginia Discovery Museum, and the problem being considered is an inefficient and outdated volunteer hours management system.

2.1 Client Interview Summary and Customer/User Discovery

The client interview was conducted in the form of a client meeting with some members of the team and providing background information before answering specific questions from the teams present. The listed questions and answers are in Appendix A along with other notes from the client interview.

The client viewed the current situation for tracking volunteer hours as an inefficient system that requires volunteers to manually check in and check out in a paper binder. They didn't necessarily think the current system was unusable, but they wanted to see an improvement in collecting and tracking the hours. The client also has to manually transfer all of those hours from the papers into a Google Sheets spreadsheet to keep records of every volunteer's hours for the past seven years. In the past, the client has looked into volunteer hours management services, but the current options have all been too expensive for the museum to budget for. The client has also tried working with a student group for a solution but didn't receive a viable product for long-term usage.

Our team viewed the problem of the inefficient management system as an essential way we could benefit the museum through a product we would develop that would solve the problem. We viewed the problem as having to set up a local website that feeds into a database where we could track volunteer hours and email them as a .CSV file to the client. The client clarified that this problem involves developing an entire volunteer management system to replace their current system, including an application form, a calendar system for volunteers to sign up for shifts, and hours tracking. They specified features for our team to develop in an ideal solution that are ways for our team to improve our technical skills and learn about creating a professional-level software solution.

In Appendix A, we utilized coding to find elements in common between how we viewed the problem and how the client viewed the problem. Some similarities included how both of us thought the current system was inefficient for collecting and tracking volunteer hours and that although it might be usable in the current situation, it could be improved significantly. Some differences in how we viewed the problem were the actual problems being solved with this solution. Those similarities and differences helped us form our current view on the problem: implementing a volunteer check-in/check-out system, a calendar for sign-ups, and hours tracking with login account functionality.

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Customer/User Discovery

      In this volunteer management system, the client is Lindsay Jones, who oversees volunteer coordination and requires an efficient way to document hours, schedule volunteers, and manage records. Both users and customers are volunteers themselves, and they interact with the system to log their hours, check schedules, and sign up for shifts. While the client is responsible for overseeing and maintaining the system, the users rely on it to streamline their volunteer experience. The system must balance the client's need for administrative control with the volunteers' need for a simple, accessible interface to manage their participation.

2.1.1 Model of problem
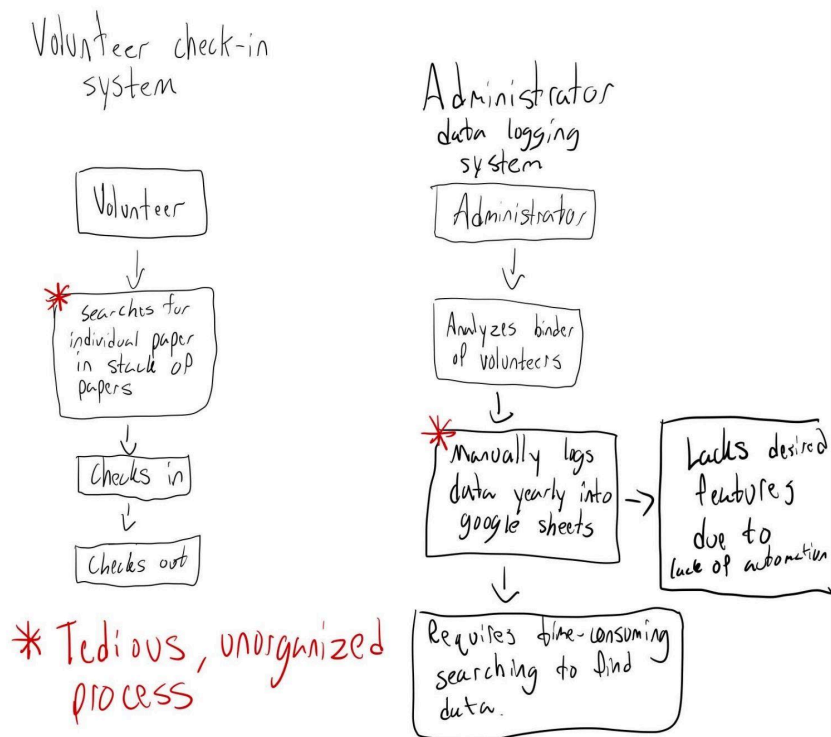
2.1.2

2.2 Literature Review

Automated management systems are critical for streamlining operations and improving data organization, especially for volunteer management at non-profits where there can be extensive data to keep track of and input. Since volunteer-driven operations depend significantly on streamlined management, shifting from paper-based to automated systems presents considerable advantages. These timekeeping systems in volunteer management save time, increase accuracy, and improve communication. This literature review investigates the role of volunteers in nonprofit organizations and technological advancements in volunteer management systems, emphasizing their cost-effectiveness, functionality, and implementation in nonprofit settings like the Virginia Discovery Museum (VDM). By examining both existing systems and specific client needs, this paper will delve into the development of an optimized solution that balances functionality, cost, and security.

Timekeeping and effective communication are key aspects of maintaining an organized and effective volunteer base. Throughout the 1990s and 2000s, businesses have transitioned from inefficient and time-consuming paper-based timekeeping systems to automated, online timekeeping software systems. Automated timekeeping systems are critical to businesses and employers as these systems "streamline processes by automating calculations, integrating data and producing reports … help[ing] employers save time and money" (Beyda & Jefferiss, 2011). However, as these benefits aren't only applicable to employers, organization managers and volunteer coordinators may reap the same benefits by transitioning from a paper to an automated software timekeeping system.

Nonprofit organizations require volunteers to support their effectiveness, making them crucial for success. Volunteers are essential to nonprofits, as they contribute not only their time but also their skills and passion, reducing operational costs and expanding the organization's reach (Raj, 2022). With all the bases and requirements for a local nonprofit like the VDM, a volunteer base is necessary to maintain daily operations. By optimizing volunteer administrators with active calendar scheduling, automatic hour tracking, and improved communication, nonprofits can ensure reliable and effective volunteers. Additionally, nonprofit organizations must operate within legal and financial constraints to ensure compliance and long-term sustainability. Regulations governing nonprofit organizations, such as tax requirements and financial reporting, impact how volunteer programs can be structured and funded (Virginia Tax, 2018). With all of these financial constraints non-profits may face, it is essential to develop a cost-effective system that maximizes volunteer utility and follows the law.

Current solutions for a volunteer management system include Track It Forward and VolunteerHub. VolunteerHub provides features to maintain a volunteer database, schedule shifts, recruit and fundraise, and report volunteer metrics. They have "helped thousands of organizations manage billions of volunteer hours" (VolunteerHub, n.d.). Track It Forward also offers automated volunteer management features similar to VolunteerHub, including time tracking, event RSVPs, advanced verification, and reports (Track It Forward, n.d.). However, both solutions require a monthly payment, with $143/month for the minimal VolunteerHub plan and $12/month for the minimal Track It Forward plan.

When creating a solution to the current problem, an important goal to focus on is functionality. Some key functionality aspects that were requested by the client are a scheduling system, volunteer data storage, and an automatic reminder system. It should be noted that the

client also requested other functionality aspects, such as language assistance and a simple UI. Still, these features will be rolled out after accomplishing the main requests. To develop a scheduling system it would be efficient to look towards building an interactive calendar. A method to achieve this would be to combine a front-end UI with a back-end database to display stored data in an easy-to-understand manner. The React library and a database such as Firebase are some possible tools that could be utilized to satisfy the client's needs (Google, 2019). By keeping this system interactive, it should be easy for users to request shifts, trade shifts, or drop shifts. The client has also requested the storage of data such as volunteer contact info, hours worked, etc. This can also be completed using Firebase or other methods such as Google Sheets API (Google, 2016). To develop the automatic reminder system an SMS API is required. An issue is presented since sending SMS messages is usually paid (Twilio, 2010). The client will most likely be alerted of this issue, or further research will be conducted to find a workaround.

Storing and securing volunteer hours for the Virginia Discovery Museum needs a database solution that is specific to the client's specifications and the user profiles. Right now, the museum uses a paper-based system that is inefficient and not very secure either, which may cause problems in data processing and increase the risk of errors. However, shifting the hours tracking system to a cloud-based database can address these limitations by offering scalable storage for volunteer hours and ensuring accessibility for both the museum administrators and the volunteers themselves (A Study on Cloud Database, 2012). SQLite is an example of an embedded database that allows for the integration of existing spreadsheets, which will minimize costs and maintain data accuracy (Bi & School of Computer Science and Information Technology, 2009). There is also the matter of security measures, such as input validation, which is essential to maintain the integrity of the check-in and check-out logs (Database Management as a Service: Challenges and Opportunities, 2009). This idea of using a database aligns with ethical and safety concerns and provides a reliable system that simplifies volunteer management.

In summary, transitioning from traditional paper-based systems to automated volunteer management solutions brings significant advantages for both employers and nonprofit organizations, such as the Virginia Discovery Museum. By utilizing tools like interactive scheduling, data storage options, and automated reminders, nonprofits can effectively navigate the challenges of managing volunteers. The capabilities of cloud-based databases, including Firebase, along with integrated solutions like SQLite, offer a scalable and secure alternative to outdated paper methods. Moreover, it is important to both the client and the longevity of the solution to ensure these solutions are affordable and adhere to legal and financial standards. By concentrating on the client's specific functionality and security requirements, this review outlines the necessary steps to develop an efficient, reliable, and user-friendly volunteer management system that fosters long-term sustainability for nonprofit organizations.

2.3 Problem Definition

Historically, businesses have logged their employees' hours on paper using manual time-logging systems or time clocks. However, during the digital age, businesses and organizations have transitioned from paper-based systems to online software systems, which save time, reduce human error, and improve overall efficiency and accuracy in tracking

employee hours (Beyda & Jefferiss, 2011). The Virginia Discovery Museum (VDM) had previously attempted to transition from its current paper-based volunteer tracking system to a digital system; however, the required infrastructure and software proved too costly and complicated to operate for both administrators and volunteers (L. Jones, personal information, January, 30th, 2025).

The current state of the VDM's volunteer management system is a physical, inefficient process that causes excess work for the volunteer administrator and confusion for the volunteers. Specifically, there are paper records of all volunteers who log their hours by hand and a spreadsheet recording the total hours of each employee. This process is tedious, as the administration has to maintain physical records of the volunteers and then manually transfer them to the spreadsheet. This current system can lead to writing errors, lost or forgotten data, and a hassle for the volunteer administrator. Currently, to register for a shift, a volunteer must email the administration, which has to check if that time is open, and the administration has to email the volunteer back about whether the time is open. If the time is open, the administrator adds the volunteer's shift to their Google Calendar, which is how they monitor the upcoming shifts. Additionally, if a volunteer wants to cancel their shift, they again have to email the administrator.

An ideal state of the solution should yield a situation in which the volunteer administrator, Lindsay Jones, at the Virginia Discovery Museum, can efficiently have access to all of the volunteer hours that are tracked and organized neatly. The solution should allow volunteers to sign up for shifts, get reminders about upcoming shifts, cancel shifts, and automatically populate a calendar with the volunteer hours according to the client's specifications (L. Jones, personal information, January, 30th, 2025).

The software solution must allow volunteers to sign up, manage shifts, and track hours through a low-cost (or no-cost) online website. Additionally, the solution must be functional by April 26th, 2025. Moreover, it should be easy to implement, easy to use for all ages, and accessible across devices. The system should also provide quick data retrieval for the volunteer administrator, as issues in the past have caused volunteer administrators a headache.

2.4 Summary of sociotechnical considerations in problem

Solving this problem requires being economically sustainable, as the client wants the solution to require no money for long-term financial viability. This means we will mitigate using paid applications and instead use open-source software for any aspects of our solution we don't develop ourselves. Additionally, the transition from paper to online software will significantly reduce the paper required to log every volunteer's hours, aiding the environment. Our problem presents a societal challenge as the VDM is required to allocate its time and resources to organizing volunteers and logging their hours. Solving this issue will allow Lindsay and her volunteers to spend more time and energy to serve the museum and its community.

The primary actors for this problem are the administration of the VDM and their volunteers, as both need to access the application. Because of the diverse population of volunteers, including the elderly and those who may not speak much English, the design of this application must adhere to the principles of Universal Design to promote accessibility. For

example, text should be large so that it is easy to read and simple to understand. It should also be easy to navigate between different software features, such as the login, calendar, and tracking of total hours.

One primary concern Lindsay had with previous solutions to the issue, in addition to the cost, was that the solutions and infrastructure were too complicated for both the staff and volunteers to operate. Due to these concerns, principles of universal design, such as simple and intuitive use, equitable use, low barriers to entry, and minimal cost, must be considered throughout the design process. For example, some volunteers only speak Mandarin or Spanish, so we must include a translation option on the volunteer website.

The logged hours and information of the volunteers at the VDM must be safely secured and stored for proper funding reports and the trustworthiness of the hours. Since many of the volunteers are students, the hours must be ethically logged to be a trustworthy source of information and to uphold the reputation of the VDM. Additionally, the application must be thoroughly vetted by our client, as criminals are strictly prohibited from being volunteers at the VDM.

3. Initial Solution Ideation

[Usually sections have some kind of introductory paragraph(s) before subsections are introduced, depending on chapter need and organization]

3.1 Development of Multiple Designs

[Students should explain and outline the iterations of alternative initial designs]

3.2 Design Decision Discussion

[Students should explain rationale behind design selection]

3.2.1 Decision Matrix

[Students should construct a decision matrix using their objectives and constraints to help make the decision about selected solution]

3.2.2 Sociotechnical Considerations in Selected Design

[Students should incorporate which

3.3 Detailed description of design

[Students will describe their selected design in detail, including drawings of software flowcharts, material selections, etc]

3.4 Initial Fabrication and Testing Plan

[Students should describe their fabrication and testing plan as outlined in their proposals]

3.4.1 Project Workflow

4. Testing Results, Analysis, and Design Iterations

[Usually sections have some kind of introductory paragraph(s) before subsections are introduced, depending on chapter need and organization]

4.1 Testing procedure

[Students should describe and lists tests that were conducted on their final product, including the type of data collected, important thresholds, and how data will be interpreted. Full procedures should be included in an Appendix]

4.2 Testing results and analysis

[Describe each test result, including: did anything unusual happen when conducting the test? Any outliers? Include tables and plots of data with comments – what can be correctly inferred from the presented plots?]

4.3 Informed Design Revision

4.3.1 Justifications based on data

[Summarize how testing results indicated a design revision was required]

4.3.2 Design revisions

[explain what revisions were made to the initial solution based on the data and results]

5. Summary of Final Solution

[Usually sections have some kind of introductory paragraph(s) before subsections are introduced, depending on chapter need and organization]

5.1 Description of final design

[Students describe their final design, including drawings]

5.1.1   Detailed description of final design

[Students will describe their final design in detail, including drawings of software flowcharts, material selections, etc. Be sure to include what changed from the proposed design in Chapter 3 and why]

5.1.2   Design performance

[Describe any tested metrics that indicate the successful performance of your solution, such as full-scale testing]

5.2 Reflection of final solution

5.2.1   Fulfillment of objectives and customer needs

[Reflect on how the objectives, constraints, customer needs, and established success criteria are fulfilled by your solution. If not, explain why or how these could be addressed, or why they were not addressed]

5.2.2   Sociotechnical considerations in final design

[Discuss sociotechnical considerations of your final design, using the Challenge Essential Questions to guide this response. Reflect on the proposed and actual sociotechnical considerations of your solution, comparing answers from Section 2.4. Were these fulfilled and/or considered? How?]

6. Recommendations and Future Work

[Usually sections have some kind of introductory paragraph(s) before subsections are introduced, depending on chapter need and organization]

6.1 Recommendations

[Discuss any recommendations for future work of this solution. How could somebody continue this work? Can you provide recommendations for the next team of engineers that would continue this? How could you continue to refine the solution? Do you have any recommendations for client use of your solution?]

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Appendix A:

Client Interview Notes:

- Need volunteers for everyday of the week
- Types of volunteers:
    - Annual Events volunteers
    - Exhibit volunteers
        - Exhibit building (can happen during off hours)
    - Gallery Volunteers
        - Up to 3-4 at one time
        - 2:30 - 5 busier
        - 11:1pm - less busy
    - Front Desk Volunteers
        - One 1 per shift
    - Program volunteers
- Hours are Monday - Saturday 930am - 5pm + private rentals on Sunday (volunteers should only be able to input hours during those time slots)
- Private events are at variable hours so needs to be some sort of admin privilege to confirm private off hours volunteering (Sundays)
- Age range of volunteers is 13+
- Some volunteers don't know English as well (build in some accessibility features? Or make it very simple to understand)
- The current volunteer system is all on paper
    - honor system (but also planned ahead of time anyways, double checked with calendar of scheduled hours)
    - (end of each month, total up all the hours)
    - Their spread sheets includes the name of the group they come from (i.e. Megan Smead, Alpha Chi Sigma, etc.)
    - Right now everything goes into an excel spreadsheet (someone has to manually do that from paper hours)
    - Maybe** have a system that automatically inputs the hours into the Volunteer TIme Sheet they already have (unless too complicated)
- Include an entire scheduling system that volunteer coordinator has access to and volunteers can change their times of scheduling (some restriction for it, certain amount of switches of shifts allowed per month?)

- Maybe need admin permission to make a change to schedule
- Or just provide schedule for volunteers can see, but have to email to change/send a notification to change shift
- More data driven analytics to check who exactly is volunteering (pull data from Google form that they use to sign up)
  - Categorize by organization/high schoolers/UVA students/senior citzens
- Should be able to work with existing technology/resources (minimal budget)
- Shifts are 2-4 hours most of the time, but check in check out time
- Include apply feature and status of application
- Implement Reminder of tasks for that shift feature
- No court appointed volunteer hours allowed (community service due to criminal reasons)
- Every 5 hours volunteered earns a free pass to go into the museum (don't have to pay)
- High schoolers have separate grouping and spreadsheet (TEEN internship program), tracks interests and hobbies for these volunteers

Client Interview Questions:

Coding:
- Blue is client's expectations
- Yellow is our expectations
- Green is overlap

1) What feature would you like to see in this product?

2) What has not worked/can be improved from previous solutions to this problem?

3) What type of product would you like to see for the database (website, app, etc.)?
- Website or app works fine

4) Is each volunteer going to log their hours or will someone at the front desk log it for them?
- The volunteers need to be able to log their hours themselves

5) Do you want the product to be deployed as a website or hosted locally?
- Website works better, have something there at the museum too

6) Is user authentication required?
- Not required

7) Do volunteers need accounts (need to sign in) before inputting their hours?
- If used, needs to include normal login features (forgot password feature, create new account)

8) Do volunteers need to check in and check out or log their total hours when they finish?
- Check in and check out needed, need to be able to specify what position is being checked in for

9) What information should volunteers input when they log their hours?
- Volunteer position

- Group/Organization/or Individual
- Hours
- Name
- Age
- Languages spoken

10) ALS aesthetics important?

- Functionality comes first
- Looks are very minimally prioritized, but if time then implement nice features that involve the VDM logo, branding, stars and shapes, Railway font, etc. (look at website for inspiration)

11) Should the system store personal data about volunteers (contact info, role preferences, or training certifications)?

- Store contact info
- Past criminal record
- How they heard about it
- Reference
- Which volunteer positions they prefer

12) Should the system send reminders to volunteers about upcoming shifts or unlogged hours?

- Send reminders is preferable

13) How would you handle a situation where volunteers forget their hours?

- Calendar can color code by volunteer position, staff will double check the calendar to make sure someone checked in for that time slot they were supposed to be at
- Automate some notification that tells volunteers that they have a shift soon (1hr or 30min before shift),
- automate a notification to the coordinator that tells them if the volunteer didn't show up

14) Are there any accessibility features we should include for volunteers of all ages (e.g., larger text, voice commands, or mobile-friendly design)?

- Language Barrier (we know Mandarin and Spanish speakers)
- Larger text
- Simple UI for elderly

15) Do you want the system to track volunteer availability or allow volunteers to sign up for shifts?

- After the initial vetting process, volunteers can sign up for their own shifts without having to reach out to the coordinator, create some sort of calendar (different positions have different number of slots available)
- If someone cancels or changes a shift, send a notification to the volunteer coordinator
- If someone cancels too many times (around 3 times), implement a system that flags that volunteer to the coordinator
- When hitting the cancel or shift button, have a pop-up that offers them another available shift

Client Discovery Assignment:

Part 1: Identify your assumptions about the customer, user, client, problem, and solution by creating a hypothetical customer/user persona. Address the following questions:

Who are the ideal users of your technology (age, location, education, occupation)?

Age: Any ages ranging from as young as 14 years minimum to elderly, possibly 80 years old?

Location: Virginia Discovery Museum

Education: Must know how to use a computer and interact with the user interface

Occupation: Volunteer at Virginia Discovery Museum

What do they value and prioritize?

They value and prioritize quick and easy input of their hours, who they are, and how easy it is to understand what they are completing.

What do they want to do better?

They want to be able to input hours quicker and be able to view their hours quicker.

Why are they frustrated with current methods for doing that?

It may take a longer amount of time to write down hours or navigate through where their name was written or the hours were written.

What technologies are they likely familiar with and proficient in?

They are likely familiar with being able to type in words (such as their name) and numbers into a search engine like google, so typing words and numbers should be a simple task volunteers are proficient in.

Part 2: Generate a list of (at least 12-15) meaningful questions to ask your client during the interview.

1) What feature would you like to see in this product?

2) What has not worked/can be improved from previous solutions to this problem?

3) What type of product would you like to see for the database (website, app, etc.)?

4) Is each volunteer going to log their hours or will someone at the front desk log it for them?

5) Do you want the product to be deployed as a website or hosted locally?

6) Is user authentication required?

7) Do volunteers need accounts (need to sign in) before inputting their hours?

8) Do volunteers need to check in and check out or log their total hours when they finish?

9) What information should volunteers input when they log their hours?

10) ALS aesthetics important?

11) Should the system store personal data about volunteers (contact info, role preferences, or training certifications)?

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Appendix B:

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