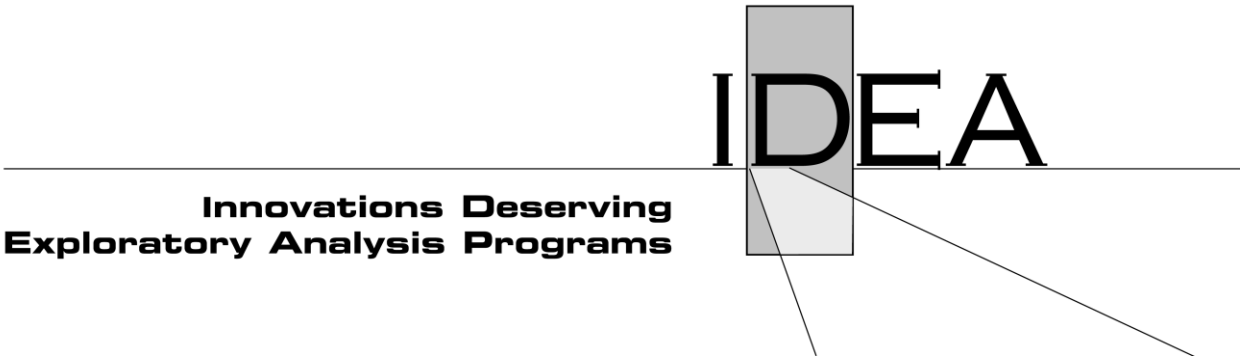

Transit IDEA Program

Open Platform to Attract, Organize, and Coordinate Volunteers for Rural and Small Urban Transit

Final Report for
Transit IDEA Project 97

Prepared by:
V. Dimitra Pyrialakou
West Virginia University

January 2024

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Open Platform to Attract, Organize, and Coordinate Volunteers for Rural and Small Urban Transit

Transit IDEA Program Final Report

IDEA Project TCRP J-04/IDEA 97

Prepared for

The Transit IDEA Program
Transportation Research Board
National Academies of Sciences, Engineering, and Medicine

by

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ACKNOWLEDGMENT

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EXECUTIVE SUMMARY

One of the most critical challenges facing rural and small urban transit agencies in the United States (U.S.) today is the scarcity of available funds. Although volunteers can help transit agencies reduce operational costs, barriers such as difficulties attracting, retaining, and coordinating volunteers, inhibit the widespread use of volunteers by transit agencies.

This project proposes an online platform for transit agencies to register, organize, and manage volunteers. A review of the limited literature on transit volunteering revealed an ongoing transition from paper-based processes to technology adoption among agencies. However, existing technologies lacked automation for task assignment and volunteer matching. The proposed platform includes two interfaces (a volunteer and a transit agency interface), one to collect and store data related to volunteers and one that stores all tasks and associated requirements. Furthermore, the platform incorporates an optimization matching engine that automates the assignment of tasks to volunteers.

The team advanced the proposed system to a prototype support platform for application and potential commercialization through the design, development, and testing of the platform. The project was performed in two contingent stages: Stage 1 (define and undertake essential research studies) and Stage 2 (case study and decision support tool kit design). The testing was done in Monongalia County, West Virginia, in partnership with the Mountain Line Transit Authority (MLTA).

In **Stage 1**, the basic platform was developed. The platform design involved two distinct components: the platform interface design and the optimization engine design. Design criteria for both components were developed based on best practices and a literature review, focusing on transportation volunteering programs and transportation volunteering coordination practices. The platform interface was designed as a website in this initial exploratory project and has two sides (volunteer and agency), with the potential to develop an additional side to accommodate customers directly. The design of the optimization engine entailed the development of a mathematical optimization model that had, as a basis, the following two fundamental goals:

1. Identify the "qualified" volunteer for each required task, and
2. Minimize the "travel cost" required for the volunteers to complete the task.

The "qualified" volunteer was considered as the one who has both the skills and resources needed to complete the task and has indicated availability. The travel cost was assumed to be determined by the distance volunteers must travel to begin their assigned tasks. Next, the platform was subjected to initial testing using simulated data to assess the solution quality and evaluate the logical assignment of the tasks.

Stage 2 involved users' and stakeholders' evaluation of the platform, beta testing, and its refinement based on the collected feedback and testing. Research results supported this proof-of-concept and indicated that platform users find the process of registering for a volunteer account and navigating through the platform easy to use and understandable and believe that the platform is convenient and useful and would enable them to register as a volunteer and volunteer their time with the agency.

Pay-Off Potential: The proposed platform has a great potential to help transit agencies with recruiting volunteers by providing a novel, easy, and straightforward way for volunteers to sign up, assess volunteering opportunities, schedule activities around their availability, track service hours, and, if applicable, get compensated for their efforts. In addition, since the platform is a cloud-based web application, it can facilitate an expansion of the potential demographic pool of volunteers and allow the agencies to attract and incorporate more volunteers from younger generations. Finally, this platform has the potential to improve the allocation of resources, facilitate cost reductions, and increase the efficiency and effectiveness of transit operations. Specifically, the platform can help transit agencies assign and coordinate volunteers to specific shifts and facilitate the driving assignments for volunteer drivers. Current practices often require a transit employee to communicate and coordinate with the volunteer and allocate tasks. Thus, the use of this platform can ensure efficiency and the best allocation of agency resources. Furthermore,

even though transportation volunteering is mainly focused on volunteer driving, this platform allows the matching of volunteers with a variety of additional transit agency needs, such as communication-related needs or general labor-related needs. This feature can further minimize operational costs while helping transit agencies provide more personalized services to meet the mobility needs of their customers.

Product Transfer: This project is a proof-of-concept at its core. To ensure that this innovative platform will be further developed and commercialized to be used in practice, the research team followed a four-part approach. First, the team has partnered with MLTA, a local leader in transit, for the development and beta testing of the platform. Second, it has engaged key stakeholders and interested parties throughout the project. Third, the team has disseminated the project results using its local network of stakeholders and through national research and practice conferences. Finally, a funding plan has been developed and future funding will be sought for the full development and testing of the platform (i.e., generalization and scaling of the concept product).

IDEA PRODUCT

VOLUNTEERING PLATFORM CONCEPTUALIZATION

This project developed an online platform for transit agencies to register, organize, and track volunteers, while also serving as a decision support system to manage and coordinate volunteers. The proposed platform has two interfaces (a volunteer and a transit agency interface), one to collect and store data related to volunteers and one that stores all tasks and associated requirements. Furthermore, the platform incorporates an optimization matching engine that automates the assignment of tasks to volunteers.

Figure 1 presents a conceptualization of the platform.

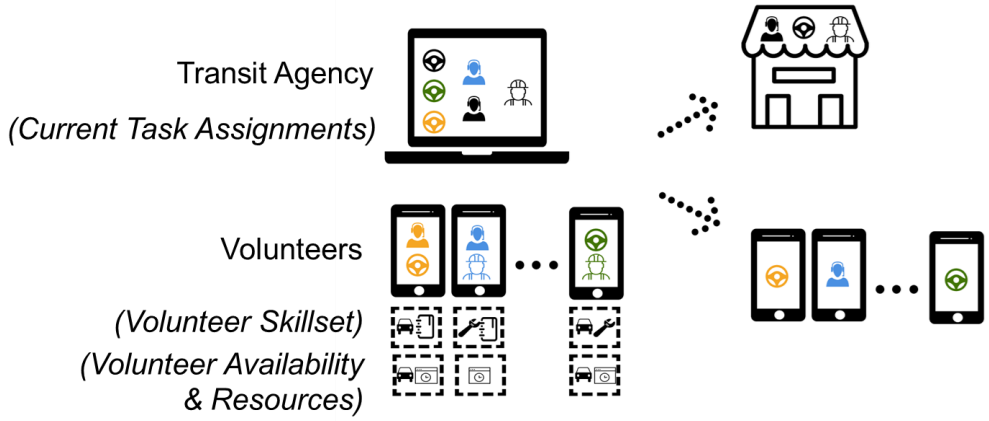

FIGURE 1: Platform Design Conceptualization.

Through conceptual design, development, and testing, the team advanced the proposed system to a prototype support platform for application and potential commercialization. The following sections provide detailed descriptions of the platform's design and implementation, and summarize the basic concept and innovation, the activities undertaken to support this proof-of-concept work, and the potential future directions.

VOLUNTEERING PLATFORM DESIGN AND IMPLEMENTATION

The platform design involved two distinct components: The design of the platform interface and the design of the optimization engine. The sections below present the main characteristics of each design.

Design of Platform Interface

The platform was designed as a website in this exploratory project. The platform has two interfaces (the volunteer and the agency interfaces) and includes several key elements, as presented in the following sections.

The ***volunteer interface*** includes a sign-up sheet for the volunteers (or registration page), a log-in page, the volunteer's profile page (or volunteer dashboard) as well as two additional pages for volunteer drivers: a driver's license and a vehicle information page, and finally, a task page (or task dashboard). The ***transit agency*** interface includes a task-focused page (or task dashboard) and a volunteer-focused page (or volunteer dashboard). Several key features have been included in each of these pages, as described in the following sections.

Volunteer Side

On the volunteer side, the *volunteer sign-up sheet* includes the volunteer's basic personal information and choice of username and password. By providing this information, volunteers register in the volunteer pool and create an account they can later access by entering the chosen login information on the *login page*.

The *volunteer dashboard* is the space where volunteers are directed after they log in to the website. When a volunteer registers for an account after completing the registration form discussed above, they can update their profile by providing any missing information. To do so, they will be able to access one of three web pages: their *profile page*, their *driver's license page*, or their *vehicles' page*. The specific elements included in each page are described below.

- Profile page: *(i)* detailed profile information, including personal and contact information and skills *(ii)* the stated availability of the volunteer.
- Driver's license page: information regarding the volunteer's driver's license, for volunteers willing to perform driving-related tasks.
- Vehicles' page: information regarding any personal vehicle(s) the volunteer would be willing to use for volunteering purposes, for volunteers willing to perform driving-related tasks.

The volunteers can edit their profile and the two pages associated with volunteer driving at any point to revise their availability, personal information, and skills.

Finally, volunteers can access their *task dashboard* to review associated volunteering tasks and *(i)* accept/reject invited tasks, *(ii)* access the necessary forms related to a task they accepted or completed (i.e., pre-task information form or the post-task report, respectively) and *(iii)* view the information of scheduled (i.e., accepted) tasks.

A video platform walkthrough of the volunteer interface can be found here: <Volunteering Platform Walkthrough: Volunteers> and a static mockup can be found here <Static Mockup>. Please note that, initially, the mockup may take a few minutes to fully load. For the review of the mockup, the use of Google Chrome is recommended.

As part of this project, the team has also prepared onboarding material that can help volunteers register and use the platform. The training material can be found here: <Transit Volunteering Platform: How To>.

Transit Agency Side

On the transit agency side, the *transit agency dashboard* is the space where the transit agency representative (e.g., the mobility manager) is directed upon logging in to the website. The representative will be able to manage tasks or volunteers through two different pages in this dashboard. The designed elements established are described below.

On the *task page*, the agency dashboard includes the following elements:

- A list of all unassigned tasks (i.e., future tasks that have not yet been scheduled), their essential information, and links to the following actions: edit the task, assign the task to an agent, or delete the task.
- An add button that can be used to add new tasks. Clicking the "add new task" button redirects the representative to a page to enter all information associated with the new task.
- A schedule button that can be used to schedule the unassigned tasks.
- A list of all scheduled tasks and their essential information and links to the following actions: reassign, unassign, or delete task. Upcoming tasks are future tasks that have been assigned to volunteers (i.e., an invitation has been sent to one or more volunteers). By reassigning the task, the agency representative can override the system's automatic assignment and manually choose another volunteer to be invited. By unassigning the task, the task will be moved back to the unassigned list.

- A list of tasks completed by volunteers.

On the *volunteers' page*, a list of all volunteers with a summary of their contact information, their skills, and their availability will be included. From this page, the agent can view or edit the complete profile information of a volunteer.

A video platform walkthrough of the agency interface can be found here: <Volunteering Platform Walkthrough: Transit Agency>.

As part of this project, the team has also prepared onboarding material that can help the transit agency representative use the platform. The training material can be found here: <Transit Volunteering Platform for Agencies: How To>.

Design of The Optimization Engine

The design of the optimization engine entailed the development of a mathematical optimization model. For this prototype platform, through stakeholders' feedback, we decided to use three types of tasks: driving, communication-related, and general-labor tasks. All tasks are to be defined and entered into the platform by an agency representative (e.g., the mobility manager). Communication-related and general-labor tasks (i.e., non-driving) will be created solely based on the agencies' needs while driving tasks will be defined based on customer ride requests. When creating a task, the agency representative will be asked to enter the information that will support the optimization engine using the platform. It is assumed that non-driving tasks require volunteers to report to the transit centers or any other requested locations, while, for driving tasks, volunteers are to meet customers at the pick-up locations and drive them to their destinations. For the prototype platform, a driving task is defined as having a single pick-up and drop-off location. Therefore, roundtrips will be treated as two separate tasks, unless the task includes pick-up, waiting or accompanying the customer, and drop-off. In this case, the total duration of the single task will reflect this expectation.

Before being considered for a task, volunteers must enter into the platform information pertaining to their availability, skills, driving status, origin, and vehicle, if applicable. Information from the task database and the volunteer profile database will be utilized by the optimization matching engine to support the matching of tasks with appropriate volunteers efficiently.

Specifically, the optimization engine has two fundamental goals: With each assignment, the optimization engine aims to *(1)* identify the "qualified" volunteer for each required task and *(2)* minimize the "travel cost" required for the volunteers to complete the task. The "qualified" volunteer is the one who has both the skills and resources required to complete the task and has indicated to be available. Furthermore, we defined the objective of the mathematical model, such as to minimize the "travel cost" of the task(s); the travel cost was assumed to be determined by the distance volunteers must travel to begin their assigned tasks. Considering the above, for driving tasks, the model aims to minimize the distance as calculated using the pick-up location of the requested trip. On the other hand, for non-driving tasks, the distance between the volunteer's origin and the specific transit center's or other task-specific location is considered.

The developed mathematical model is described in detail in ***Appendix A1 Mathematical Formulation of the Volunteer-Task Assignment***.

Volunteering Platform Implementation

The development platform was built as a custom PHP (Hypertext Preprocessor) web application hosted on Cloudways, a subscription-based cloud services provider. The hosting services will be terminated upon completion of this project.

The platform includes the following components[1]:

- A user portal
- An admin portal
- A database to store volunteer and task records
- A solver engine for optimal volunteer-to-task assignment

Additionally, to facilitate the calculation of "minimum travel costs" for the optimization, the *Google Maps* application programming interface (API) has been integrated into the platform. The associated API key will be deleted upon completion of the project. Future applications can continue with the use of Google Maps API or other Map API alternatives.

[1] The components can be shared as a .zip file to any interested party, upon completion of the project.

CONCEPT AND INNOVATION

CONCEPT BACKGROUND

In the U.S. today there are approximately 970 urban bus transit systems that include both large and small urban agencies and more than 1,270 rural and tribal bus transit systems that operate fixed and deviated routes and demand response services (*1*). One of the most critical challenges that transit agencies face is the scarcity of available funds. Meanwhile, the largest single contributor to operational expenses is employee compensation (including drivers and administrative personnel). In 2018, for example, employee compensation and fringe benefits of all transit agencies accounted for 61% of the total operational expenses (*2*). Similarly, in 2021, despite the additional significant needs due to the pandemic, employee compensation and fringe benefits accounted for 62% of the operational expenses of all transit agencies (*3*).

This project explores the idea of reducing the operational costs of transit agencies (especially smaller-sized agencies, such as those operating in rural and small urban areas) by facilitating the incorporation of volunteers in transit operations through a volunteer transit platform. Volunteerism is often interwoven with the culture of rural areas and small towns (*4*). Although pre-pandemic volunteer rates in the U.S. might have reached their peak thus far in 2011, according to National & Community Service reports (*5*, *6*), both the overall rates and the involvement of young generations in volunteering had been increasing, with both Generation X and Millennial reaching the highest rate of volunteering so far (approximately 36% and 28% respectively in 2017). Recent research revealed that, during the pandemic, although the rates of formal volunteerism decreased, more than 23% of the total U.S. population reported that they formally volunteered in some capacity, while more than half reported that they informally "helped" members of their community in need (*7*).

The rise in volunteering is enabled by the emergence of online platforms (such as VolunteerLocal, VolunteerMatch, Volgistics Volunteer Management, and Get Connected), which streamline volunteerism and enable individuals to discover both local and virtual volunteering opportunities. These volunteer platforms, however, provide broad coordination of volunteers and are not suitable for tasks related to transportation volunteerism.

There is great potential to use volunteers to operate certain transit services to meet the demand for rural and small urban transit operations (*8*). Nevertheless, relatively few transit agencies incorporate volunteers through full consolidation. Although comprehensive recent data do not exist, a decade ago, research found that only approximately 7.5% of rural providers incorporated volunteers in their operations (*9*). From a review of existing case studies, we estimate that this number significantly underestimates today's reality (see for example, the results of Douma (*10*); of the ten agencies surveyed, seven reported to have used volunteers).

At the same time, many organized volunteer driver programs (VDPs) exist; the National Volunteer Transportation Center has documented more than 700 VDPs in the U.S. today (*11*), some of which have been incorporated into coordinated transportation systems (*12*). These programs often focus on providing services to meet the transportation needs of seniors and individuals with disabilities and receive funding from the Federal Transit Administration (FTA) (under the Program: Enhanced Mobility of Seniors & Individuals with Disabilities - Section 5310). VDPs are mostly based on volunteers (even when they are operated by an existing non-profit agency), and therefore, even though they are more flexible than traditional transit agencies, their services might be less reliable because it is often difficult to provide services on an advance-registration individual basis (*13*). In addition, many communities cannot support a volunteer program. Whether community- or agency-based, volunteering transportation programs require a critical mass of volunteers to be able to operate. In the state of West Virginia, for example, there are only three VDPs currently reported in operation (*11*).

INNOVATION

There are several challenges in the operation of VDPs. Among others, *(1)* the success of the programs relies on attracting committed volunteers, *(2)* the organization and coordination of the volunteers is a complex, labor- and resource-intensive task, *(3)* despite reliance on volunteers, financial resources are still needed (e.g. for compensations), and *(4)* such programs are simply not suitable for every community (*13*). Similar barriers inhibit the widespread use of volunteers by transit agencies.

The comprehensive literature review conducted as part of this project showed that the majority of the resources on the topic relate to volunteer drivers and VDPs and do not expand to other transportation-related areas in which volunteers can contribute (the reader can refer to the Literature Review summary in the Investigation section of this report for an overview of the results, or refer to the project's Stage I report—available upon request—for the detailed comprehensive literature review). Further, our review found that literature on the use of technology to assist in volunteer management and coordination, data collection and management, and especially matching of volunteers to customers is scant. Our synthesis of the limited information provided in the resources reviewed indicated that we are in a transitional period from predominately paper-based processes to the use of technology. It seems that VDPs are moving towards applications that can help them both manage and coordinate volunteer drivers (dispatching, etc.) and collect data. However, the incorporation of technology in many of the VDPs is still limited to the use of spreadsheets and shared documents that can help with data management and communication. In terms of task assignment and the matching of volunteers with customers, no studies were found on the automation of this process through a matching model or on any technology such as an application that can facilitate this process. This project developed an online prototype platform aiming to directly address some of the aforementioned barriers by examining this major technological gap.

Partially, the proposed innovation relies on a significant revision of the current coordination model between transit agencies and volunteers. Typically, transit agencies that incorporate volunteers have an agency representative to manually record, organize, and process information from both customers and the volunteers. Additionally, transit agencies frequently send a comprehensive list of tasks to the volunteer drivers (e.g., via email) and the drivers select their own tasks and contact customers (alternatively, the arrangement is again facilitated through the transit agency representative). This typical model is summarized in Figure 2 below.

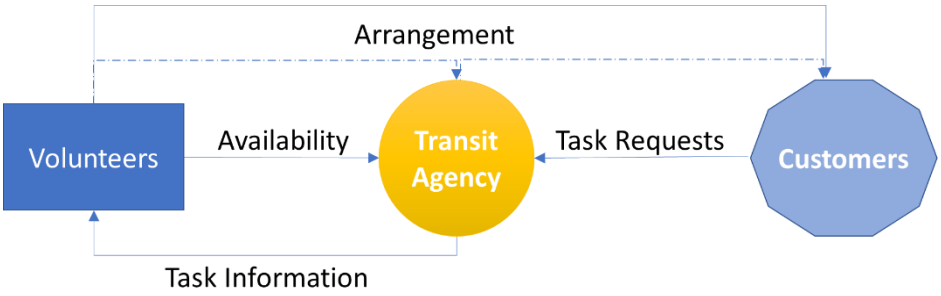

Figure 2: Common Current Coordination Model.

The current model often presents several shortcomings, an important one of which is the heavy workload placed on transit agencies. Additionally, wait times may be lengthy and the requirements for advance requests may be long. Finally, unequal treatment of customers (e.g., under-serving) may become an issue in some cases, if volunteers systematically avoid (or favor) specific customers or regions.

As represented in Figure 3, the proposed platform seeks to streamline the process by providing a mutual communication means among parties (i.e., the volunteers, the agency, and, in possible future extensions, the customers).

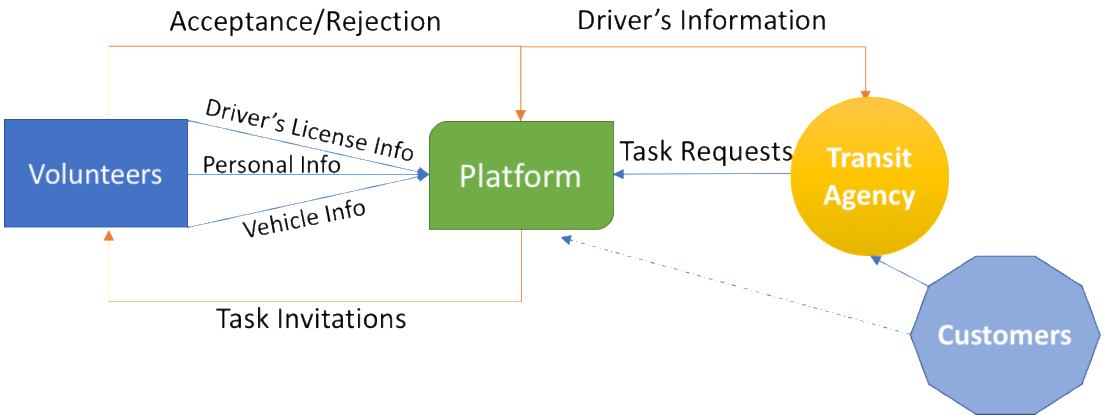

Figure 3: Proposed Innovative Coordination Model.

INVESTIGATION

This IDEA project entailed the development of a prototype platform through the design, development, and testing of the initially proposed system. The project was performed in two contingent stages: Stage 1 (define and undertake essential research studies) and Stage 2 (case study and decision support tool kit design). The beta testing was undertaken in Monongalia County, West Virginia, in partnership with MLTA.

The following sections present a summary of the activities completed and findings during these two stages, omitting administrative tasks (such as the kick-off meeting, reporting, etc.).

WORK PERFORMED IN STAGE 1: DEFINE AND UNDERTAKE ESSENTIAL RESEARCH STUDIES

In Stage 1, the basic prototype platform development included the conceptualization and design of the platform. The platform design involved two distinct components: the platform interface and the optimization engine design. The initial design criteria for both components and their associated core features were selected based on best practices and a literature review, focusing on transportation volunteering programs and transportation volunteering coordination practices. The basic platform went through rigorous testing procedures that identified and addressed bugs and usability issues.

Literature Review

This task intended to perform a comprehensive literature review and provide *(1)* insights that will guide the development and design of the platform in terms of the features incorporated into the platform and *(2)* a list of additional potential partners that might be interested in this platform. In this report, we focus on the first goal of the review and present an overview of the findings. Additional detailed information on the literature review findings as well as the results related to the second goal can be found in the Stage I report of this project (available upon request).

Two main directions were taken in the literature search and review. On the one hand, we explored government documents and professional resources that have been developed to guide practitioners who operate stand-alone VDPs or programs integrated with existing agencies (often but not always transit agencies), and, on the other hand, we explored scholarly publications. Our review of the scholarly publications focused on the use of technology, data collection and management, matching mechanisms of volunteers to customers, and any other relevant information. To remain current and relevant, we narrowed down our search to publications of the last two decades (we excluded material published in the 1990s). Following is a synthesis of the main points identified from the literature review.

Guides

The goal of this part of the review was to identify challenges and best practices in transportation volunteering that can inform the design of the volunteering platform in a way to facilitate these best practices. Six relevant guides were identified and reviewed. Most guides agreed on the challenges of operating a VDP or incorporating volunteers in an existing transit agency or other transportation provider. Further, most guides focused on similar aspects of best practices (i.e., recruitment/retention, recognition of volunteers, insurance/liabilities, flexibility, reimbursement practices, screening/training/supervision, and data collection and documentation). The review provided several insights that guided the initial design of the platform and others that were discussed with the participant transit agency and considered for enhancement of the platform during Stage 2 of the project. Further, we explored the guides for best practices regarding matching mechanisms.

One of the key issues the literature discusses regarding the use of volunteers is the personal cost of volunteers (i.e., fuel cost, etc.). This issue appears both as a factor impeding volunteer recruitment and retention and as a consideration for matching and reimbursements. Several reports, for example, discussed the consideration of additional incentives for volunteer drivers to help recruitment and retention, such as

reimbursement for no-load (or deadhead) miles (*10, 14*). Schlachman (*15*), through surveys and interviews of agencies, found that generally, dispatchers of organizations that coordinate volunteer drivers consider how far a volunteer lives from a customer. Proximity was found important both for reimbursement purposes (especially when deadheading is accounted for) as well as for other reasons, such as maximizing the service a volunteer can provide and promoting the sense of neighborhood and community, which can increase satisfaction (for both volunteers and customers). Consequently, the project team decided to develop a matching mechanism that focuses on minimizing the volunteers' travel costs as one of the fundamental goals for the matching of volunteers with customers.

Other insights that guided the platform design are as follows [*actions taken in brackets*]:

- Hendricks et al. (*16*) discussed that targeting affinity groups and/or partnering with local organizations can aid recruitment. [*The platform collects information on whether the volunteer is participating as an individual or a member of an organization.*]
- The importance of ongoing communication with drivers was mentioned (*17*). [*For all scheduled tasks, communication-related actions have been incorporated into the platform on both the volunteer and the agency sides*.]
- The ease of signing up has been mentioned to help recruitment (*16*). [*The platform is designed for easy sign-up with minimal required information. Additionally, a how-to guide for volunteers was developed in Stage 2*.]
- Flexible scheduling has been identified as a key component of retention (*16, 17*). Further literature found that volunteers often served on specific days/times (*15*). [*The platform allows volunteers to indicate their availability for specific days and times, with the option to revise this selection at any time.*]
- Although most materials reviewed focused on VDPs and volunteer drivers, some reports mentioned that volunteers could help transit agencies and other transportation providers with several tasks (*12, 15, 17, 14*). Potential roles mentioned were driver recruiter, driver recognition leaders, fundraisers/advocates, dispatchers, program marketers, trainers of other volunteers or supervisors, or transportation escorts. [*The platform is based on the premise that volunteering tasks can be driving or non-driving. The categories considered in the platform as non-driving tasks are communication-related and general labor. These categories are subject to revision based on agency needs.*]

Additional insights that were discussed with the participant transit agency for enhancement and should also be considered in follow-up developments of the platform are as follows:

- The importance of considering the specific vehicle needs of a customer and the accessibility of the volunteers' vehicles were identified (*14*).
- Most guides emphasize the importance of reimbursing volunteers (*16, 15, 18, 17, 10*), typically based on trip mileage (with or without deadhead).
- Douma (*10*) noted the usefulness of recording trip purposes for regulatory purposes, while Schlachman (*15*) identified prioritizing rides based on trip purposes as a best practice (with medical trips prioritized first).
- Most guides stress the importance of showing appreciation towards volunteers for retention purposes (*16, 15, 17, 10, 14*).
- The Washington State Department of Transportation (*18*) discussed best practices for trip reporting and associated collection of trip-related information.

Regarding the topic of matching, among the guides reviewed, only Schlachman (*15*) discussed in detail the dispatching, scheduling, and matching mechanisms that are used to match volunteers with customers for some of the case studies explored. Nevertheless, the discussion was general and hinted at mostly ad hoc matching of volunteers with customers and manual data collection (on a document or spreadsheet). For example, in one organization, volunteers were provided with all information and chose the rides they wished to serve, while in another organization, a part-time employee was responsible for matching drivers with customers and dispatching rides. There was no mention of any mathematical modeling or matching algorithms used, and the only mentions of software were related to dispatching software; however, specifics were not given (it was mentioned that most agencies either developed their own or modified software found in the market).

Scholarly Publications

In the review of publications, 19 journal and conference papers were retrieved related to transportation volunteers (most focusing on VDPs and driver volunteers). Some of the publications reviewed were only remotely relevant. Further, two related chapters from the *Introduction to Senior Transportation* textbook of Kerschner and Silverstein (*19*) were reviewed. Finally, a practice brief pertaining to technology use in VDPs was retrieved and reviewed (*20*).

Two journal papers (*21*, *22*) focused on topics related to senior transportation, and two focused on medical volunteerism (including medical volunteer driving) (*23*, *24*), and all made only a reference to VDPs and volunteer driving. One paper presented a methodology to assess potential VDP demand based on the demographic and other characteristics of an area through a case study of Georgia, U.S. (*25*). Another paper explored the operational policies of VDPs pertaining to occupational health and safety, volunteer management, and service design/delivery in rural New South Wales (NSW), Australia. The paper found that operational policies varied across services, as did the role of volunteer drivers (*26*). Another paper performed a benefit-cost analysis of six VDPs in Minnesota, U.S., and estimated that the participating VDPs save $18 -$185 per round trip when compared to other alternatives that could serve those trips (*27*). Finally, a recent paper proposed a novel demand collection system that can collect trip requests (day/time and destination information) and can be installed in the customer's home (*28*).

Many of the publications discussed topics related to benefits, best practices, and challenges of VDPs (*29*, *8*, *30*, *31*, *27*, *25*). The topics discussed were similar to the ones presented in the guides reviewed in the previous section. Two other publications explored surveys of volunteer drivers and discussed who the volunteers are, their challenges, and their motivations (*32*, *33*). Further, we should also mention here the work of Trevor Hanson and collaborators. The team has produced several publications exploring various topics related to VDPs in Canada (*34*, *31*, *35–39*). The conference publication of Hanson et al. (*37*) presents a summary of the research results on the topic over the years.

Turning to the main focus of this review, we explored literature related to *technology* use and methods used in *data collection, coordination of volunteers, and matching* of volunteers with customers. Although the seminal work of Rosenbloom (*8*) discusses the benefits rural agencies can achieve if they become early adopters of technology and innovation, literature on the topic was scarce.

Kerschner and Silverstein (*19*) discussed several topics, including volunteer recruitment, training, retention, trends, benefits of VDPs, and best practices for planning and operating VDPs. Among others, the book establishes five areas in which technology can support a VDP, that is daily operations, passenger support, data management, collaboration, and fundraising. The chapters also discussed in more depth technologies related to ride scheduling and data management. The authors indicated that standard ride-scheduling practices had been paper-based, but many programs have switched to software-based scheduling. The chapters described that software is now frequently used to schedule and manage rides, data collection, and others, but there was no mention of matching volunteers with customers. The discussion focused on volunteer drivers. Regarding data management, the authors discussed the importance of having a robust application that can collect data and organize them in an easy-to-retrieve and use way.

Henning (*20*), in a practice brief, discussed the potential of technology use to support VDPs through the exploration of several case studies. The discussion followed the five categories identified by Kerschner and Silverstein (*19*). Pertaining to daily operations and data management, the brief summarized three case studies: Needham Community Council (Massachusetts), Volunteer Transportation Center (New York), and Seniors' Resource Center (Colorado). The Needham Community Council partners with Transportation Network Companies (e.g., Uber and Lyft) to supplement the services provided by the volunteers. For rides served by the TNC, the program benefits from the TNC's comprehensive data collection system. The Volunteer Transportation Center created software to match their needs of tracking vehicle location and trip details and allow communication between the agency and the volunteers. The application has been developed for a volunteer-only program and focuses on volunteer drivers (the application does not support other tasks). Further, the application, thus far, does not support the matching of volunteers with customers. Finally, in the third case study, the Resource Center's (SRC) volunteer transportation program uses Google Docs to manage rides to communicate (non-private) ride information with the volunteers and as a sign-up sheet for volunteers to accept a ride.

In a recent study, Hanson and Goudreau (*39*) explored one year of travel data from seven VDPs in New Brunswick, Canada. The research focused on the data collection and utilization of data for planning purposes. The list of data collected includes trip purposes and trip and customer data. The authors indicate that standard VDP data collection practices typically relied on paper-based processes and a subsequent data entry into a spreadsheet. The results of the study demonstrated the importance of robust data collection and the use of data to estimate metrics that can support the planning of VDPs.

Finally, Martin et al. (*40*) presented a detailed case study of a VDP in Maine, U.S., that focuses on healthcare transportation. The paper discussed the program's operational characteristics pertaining to training, recruitment, recognition, reimbursements, coordination, staffing, and others. Martin et al. (*40*) stated that the VDP's data collection and communication were moved from a paper-based system to a software application (software app developed by HB Software Solutions). However, the paper implied that scheduling and matching are still done manually. Specifically, the paper mentioned that the program has a team of 10 schedulers and dispatchers who develop schedules and interact with the drivers (paid and volunteers).

Platform Design and Testing

Under the design task, the research team completed the basic conceptual design of the platform interface. As mentioned, design criteria for the two interfaces of the platform were developed based on best practices and a literature review focusing on transportation volunteering programs and transportation volunteering coordination practices. The project team also considered feedback from the partner transit agency and panel insights on the platform interface design provided as a response to the Quarterly reports. The basic conceptual design details are omitted from the final report to avoid redundancies; instead, the final design elements were discussed earlier in the section VOLUNTEERING PLATFORM DESIGN AND IMPLEMENTATION.

The platform testing involved three distinct components: testing the platform interfaces, implementing and validating the mathematical model as part of the optimization engine, and overall platform testing. Each of these components is discussed below.

Testing of the Platform Interface

Under this subtask, we first tested the volunteer and agency sides of the platform using locally hosted servers (without requiring the site to be live). Once confirmed at the local level, the live platform was tested via the development website. Databases storing volunteer and task-related information were created and tested to ensure proper functionality. The testing confirmed that all web pages had been linked with the databases, and all information (including profile information, driver's license, and vehicle(s), as well as task information) was accurately recorded. Additionally, other web testing actions, such as validating links

and ensuring a cohesive design throughout the interfaces, were performed.

Mathematical Model Implementation and Validation

The design of the optimization engine involved the development of a mathematical model (summarized under the platform design task). Our research team used IBM ILOG CPLEX, lp_solver, and Microsoft Excel Solver for the implementation. Specifically, a process of an implementation-refinement loop of the model using an optimization solver and test cases (i.e., simulated numerical data for volunteers and tasks) was followed. This process allowed us to validate the model and assess its performance for different problem sizes.

Testing of the Platform

The project team tested the computational performance of the model using simulated data. A set of numerical instances with different numbers of volunteers, potential volunteering tasks, and service requests were generated and used. The model was assessed across the following aspects: *(a)* the solution quality and logical assignment of tasks based on the volunteer availability and skills and the transit agency needs (effectiveness), and *(b)* the solution time required (efficiency). The solution quality and logical assignment of tasks were found satisfactory. During the testing, no cases resulted in an unsound assignment. Further, the solution time required was short; most cases tested were solved in less than one minute.

The following tables present an example of a tested case and the results of the matching process. The assignment was run for a single day with three hypothetical tasks in need of volunteers (one for a volunteer driver and two for non-driving tasks), as seen in Table 1. Among the volunteer database, three volunteers were available at different times for that day. Their information is shown in Table 2, and their distance from the beginning of each task is shown in Table 3. The solution of the model resulted in the final assignment, as seen in Table 4.

TABLE 1: Tasks In Need of Volunteers

Task No.	**1**	**2**	**3**
Task Type	Driving	General-Labor	Communication
Task Date	July 7th, 2021	July 7th, 2021	July 7th, 2021
Starting Period	3:00 PM	8:00 AM	2:00 PM
Duration (hour)	2	2	3
No. of Riders	1	N/A	N/A
Pick-up point	Mountainlair	N/A	N/A
Drop-off point	Ruby Hospital	N/A	N/A

TABLE 2: Available Volunteer Information

Volunteer	**J. Doe**	**M. Anderson**	**Z. Mychal**
Availability Periods	8-10AM	3-5PM	1-6PM
Skills			
Driving	✓	✓	
General-Labor	✓	✓	
Communication		✓	✓
Vehicle Capacity (Seats)	1	1	0

TABLE 3: Distance of Travel to Task (i.e., Volunteer's Trip Origin to Task Origin)

	J. Doe	**M. Anderson**	**Z. Mychal**
Task 1	1.7 mi	1.7 mi	3.2 mi
Task 2	2.1 mi	2.4 mi	1.2 mi
Task 3	2.1 mi	2.4 mi	1.2 mi

TABLE 4: Final Task Assignment

Volunteer	J. Doe	M. Anderson	Z. Mychal
Assigned to Task	2	1	3
Start of Assignment	8:00 AM	3:00 PM	2:00 PM
Duration of Assignment	2	2	3

WORK PERFORMED IN STAGE 2: CASE STUDY AND DECISION SUPPORT TOOL KIT DESIGN

Stage 2 involved the stakeholders' evaluation of the platform, its refinement based on the stakeholders' feedback, beta testing, and, subsequently, the beta testing evaluation and further feature refinements. Furthermore, during this stage, a future funding plan was developed. Below is a summary of the activities completed and the key findings of each task. The summary of the future funding plan is reported herein under the section PLANS FOR IMPLEMENTATION; thus, the discussion here has been omitted to avoid redundancies.

Platform Evaluation Based on Stakeholder and Platform Features Refinement

To maximize the potential of adoption, during Stage 2 of this project, the research team aimed to engage stakeholders often throughout the platform development. Early feedback was collected at the *24th National Conference on Rural Public and Intercity Bus Transportation*. Our presentation was included in Breakout Session TEC4 — Software Application case studies. In addition to the main presentation, the presenter demonstrated an early version of the platform in real-time. Connections and feedback collection were facilitated through the conference platform (chat and synchronous communication) as well as through an online feedback form we prepared.

The input of the expert review panel, the partner agency, transit agencies, potential industry partners, and other stakeholders was collected at several other points. Under this task, the research team also designed an assessment study aiming to evaluate the willingness of transit agencies to adopt a volunteering platform and to identify the associated perceived potential of such a platform. The results of the study will be used to support future funding and development endeavors. Additionally, the research team plans to disseminate the detailed findings of this assessment study through a journal publication (currently under preparation).

Overall, the stakeholders' input was valuable in guiding the refinement of the prototype platform. As an example, stakeholders raised concerns regarding the original design of the platform which only allowed the matching of volunteers with tasks through the use of the designed matching engine. For instance, the question of *how could the platform facilitate volunteers who would like to have the option to select their (driving) tasks* was asked. Upon discussions with several stakeholders, the team decided to address this potential inflexibility by creating a few options through which the transit agent would be able to override the system's assignment. In addition to the actionable feedback that guided the refinements during Stage 2, the collected input provided the team with several practical ideas for the future development and implementation of the platform. For example, the addition of a customer interface to accommodate direct travel requests from customers emerged from several discussions as a potentially valuable extension.

Beta Testing and Beta Testing Evaluation and Platform Refinement

The prototype platform was deployed on a secure server environment for the initial demonstration and beta testing. A collaborative, iterative development has been proven imperative for this stage of the project. The team conducted several feedback sessions with the partner agency to gather valuable insights and suggestions for improving the functionality and usability of the platform from the perspective of the transit agency. Based on this process, several platform features were refined, and additional concerns were addressed, whether within the system through feature modifications, or using external tools (i.e., using

shared spreadsheets and forms linked with the platform).

The user testing was completed with students recruited through a Civil Engineering class (CE-434/593D: Public Transportation). The students were onboarded and oriented, tested the platform, and their feedback was collected through a survey (N=37). The feedback indicated that volunteer platform users find the process of registering for a volunteer account and navigating through the platform easy to use and understandable. In addition, the feedback suggested that platform users believe that the platform is convenient and useful, and would enable them to register as volunteers and volunteer their time. Below are some of the related remarks made by the participants:

- "This platform streamlines the entire procurement and finding of volunteers while enabling the organized systematic process of displaying invites to be accepted."
- "[The platform] makes it easier for those that want to volunteer to choose when and what they want to help with."
- "[The platform] allow[s] individuals that want to be involved in improving the [transit] system the option to volunteer. The [platform] is easy to use so I feel that will attract users to create a profile. If the system was difficult to navigate I feel individuals would not give the time to create a profile."
- "[It is] [e]asy for volunteers to sign up and get a task."
- "It could ease the process of reaching people who would like to volunteer."

A summary of other key survey results is included in **Appendix A2.**

Additional recruiting efforts involved the design of a flyer in partnership with MLTA and the systematic recruitment of volunteers through the WVU student body. The flyer is included in **Appendix A3.** Recruitment Flyer

PLANS FOR IMPLEMENTATION

This project represents the first documented proof-of-concept endeavor focused on the development and implementation of a volunteering platform tailored for transit agencies to efficiently attract, organize, and coordinate volunteers. Moving forward, the team aims to develop and test a scalable platform to support broader implementation and potential commercialization. Key steps identified that can facilitate this future direction include securing funding, engaging stakeholders, continuing iterative development, and forming strategic partnerships.

To facilitate the full development and testing of the platform (i.e., generalization and scaling of the concept product), the team has outlined several funding strategies:

- Actively pursuing grants from state Departments of Transportation (DOTs) and foundations supporting innovative mobility solutions.
- Considering the pursuit of a Type 2 Transit IDEA grant in collaboration with an industry partner. An industry partnership with a mobility technology company is crucial to overcome capacity constraints in large-scale software development and leverage enhanced capabilities in areas such as advanced algorithm implementation, platform and app development, and efficient tech project delivery.
- Exploring strategic partnerships with established companies sharing relevant missions and goals, such as Ridemathing companies like Agile Mile, microtransit companies such as VIA and Liftango, and Volunteering tech companies like VolunteerMatch.
- Seeking additional partnerships with state and local governments, transit agencies, and potential sponsorship opportunities through the Federal Transit Administration's (FTA) mobility innovation programs.

To generate interest, the team will continue engaging stakeholders through targeted outreach efforts, leveraging insights from the platform assessment study, sharing informative material, and conducting demonstrations to showcase the platform's potential for facilitating transit volunteering.

CONCLUSIONS

This project focused on the development of a proof-of-concept volunteering platform that can effectively serve as a minimum viable product. The results of the project present compelling evidence of the proposed platform's potential to serve as a decision support system that can help transit agencies capitalize on the benefits of using volunteers.

The expected impacts of the adoption of the proposed volunteering platform entail the following:

- **Volunteering Recruitment and Engagement:** The proposed platform has great potential to help transit agencies with recruiting volunteers by providing a novel, easy, and straightforward way for volunteers to assess volunteering opportunities, sign up, and schedule activities around their availability. Additionally, the proposed user-friendly approach is expected to not only attract volunteers, but also keep them engaged by allowing them to track service hours and additional information regarding their completed tasks, be recognized for their service, and, if applicable, get compensated for their efforts.
- **Volunteer Base:** By offering a cloud-based web application, the platform has the potential to contribute to the expansion of the demographic pool of volunteers and allow the agencies to attract and incorporate more volunteers from younger generations, who are more accustomed to online engagement. The diversification of the volunteer base can provide new perspectives to the transit agency while enhancing the sustainability of a volunteering program.
- **Resource Allocation and Efficiency:** The platform is also expected to improve the allocation of resources, facilitate cost reductions, and increase the efficiency and effectiveness of transit operations. Even though transportation volunteering is mainly focused on volunteer driving, this platform will allow the matching of volunteers with a variety of additional transit agency needs, such as communication-related needs (e.g., booking follow-up/reassurance calls, material translation, and survey administration) or general labor-related needs (e.g., shelter inspection and accessibility assessment/documentation near stops or along bus routes). This feature will minimize potential costs while helping transit agencies provide more personalized services to meet the mobility needs of their customers.
- **Coordination and Task Assignment:** Current coordination practices often require a transit employee to communicate and coordinate with volunteers and allocate tasks manually. The proposed platform can transform this process by automating task assignment and coordination. This shift can ensure the optimal utilization of agency resources, the reduction of the administrative burden on transit employees, and the promotion of efficient and effective task execution.

In conclusion, the potential impact of the proposed platform is multi-faceted. A shift in volunteering practices through the use of a volunteering platform with the described capabilities has the capacity to simplify and modernize the volunteer management process, streamline volunteer recruitment, broaden the volunteer demographic, and optimize task allocation. Overall, this project provides evidence that the platform aligns with the evolving needs of transit agencies (especially rural and small urban agencies), and can contribute to the enhancement of the role that volunteers can play in addressing the mobility needs of their community. Nevertheless, to ensure meaningful impacts, the continued development and future deployment of a scalable platform that is ready for application and potential commercialization is imperative. To support these future directions, securing funding, engaging stakeholders, continued iterative development, and strategic partnerships have been identified as crucial steps that the project team will continue to pursue.

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APPENDIX A1 MATHEMATICAL FORMULATION OF THE VOLUNTEER-TASK ASSIGNMENT

This section presents the assumptions and detailed mathematical formulation of the initial volunteer-task assignment (VTA) model.

Main Assumptions

Below is a set of assumptions made to mathematically formulate the problem:

- The VTA model should be solved once for each given day in advance (triggered by the agency representative).
- The VTA model can be solved on the same day or up to four days in advance.
- There are three types of tasks: driving, communication-related, and general labor.
- A task can only be identified as one of the aforementioned types. For instance, a task cannot be both driving and communication-related.
- The following information is assumed to be available for each task: the type of task, date, time, duration, and the number of volunteers needed. For driving tasks, travel information such as the pick-up, drop-off point, and the number of riders (i.e., customers) are also provided.
- Task requirements (e.g., number of required volunteers and number of riders) are considered consistent throughout the duration of the task.
- A driving task is defined as having a single pick-up and drop-off location. Roundtrips shall be dissected and considered as two tasks, unless the task includes pick-up, waiting or accompanying the customer, and drop-off. In this case, the total duration should reflect this expectation.
- There are three skill sets that volunteers will claim to have and/or provide evidence for, according to the three task types: driving, communication-related, and general labor.
- Volunteers can claim more than one skill.
- Volunteer information including availability, skill(s), and volunteer's origin is provided.
- All volunteer's information is consistent throughout all periods of their availability.
- If multiple volunteers are assigned to a driving task, the total vehicle capacity among all volunteers is considered.
- Volunteers can only be assigned to a single task in a time period that they are available.
- Tasks must be served by the same volunteer(s) throughout all their time periods (i.e., duration).

Notations

Sets and Indices

Set of Volunteers indexed by *i*	index for volunteers: $i=1, 2, \ldots, n$ (n volunteers)
Set of Tasks indexed by *j*	index for tasks/jobs: $j=1, 2, \ldots, m$ (m tasks)
Set of Time Periods indexed by *t*	index for time periods: $t=1, 2, \ldots, 24$ (24 hours, 0:00 = 1, …, 23:00 = 24)

Parameters

C_{ij}	is the cost of assigning volunteer *i* to task *j*. In other words, C_{ijt} represents the total distance volunteer *i* travels to begin task *j*.
v_j	is the number of volunteers required for task *j*.
r_j	is the number of passengers/riders for driving task *j*. For non-driving tasks, r_j takes a value of *0*.
k_i	is the capacity of volunteer *i*'s vehicle. In other words, K_i refers to the number of available seats on volunteer *i*'s registered vehicle. If the volunteer does not register a vehicle, $k_i = 0$.
s_{ij}	is a binary (0, 1) parameter representing volunteer *i*'s capability to complete task *j*. S_{ij} takes the value of *1* if volunteer *i* is able or has the required skill to complete task *j* and the value of *0* otherwise.
a_{it}	is a binary (0, 1) parameter representing volunteer *i*'s availability to complete task *j*. a_{it} takes a value of *1* if volunteer *i* is available in time period *t* and a value of *0* otherwise.
d_j	is the duration of a task (in hours).

Decision Variable(s)

X_{ijt} is a binary *(0, 1)* decision variable that takes the value of *1* if volunteer *i* is assigned to task *j* in time period *t* and the value of *0* otherwise.

Volunteer-Task Assignment (VTA) Model

The goal of the VTA model is to efficiently assign volunteers to a set of agency-defined tasks. To achieve this goal, we formulate the objective of the model to minimize the travel cost (distance) of volunteers, or in other words, the cost of assigning volunteers to tasks defined by the transit agencies, where travel costs are determined by the total distance traveled by the volunteers to begin their assigned tasks using the provided origin of the volunteer and pick-up point for a driving task or the given location of any other, non-driving task.

For driving tasks, the distance (cost C_{ijt}) is calculated by the total distance a volunteer needs to travel to begin a task (from origin to pick-up), and for non-driving task, the distance is calculated between a volunteer's origin and the transit center or other destination related to the task.

The model can be mathematically written as follows.

$$Minimize\ z = \sum_{i=1}^{n}\sum_{j=1}^{m}\sum_{t=1}^{24} C_{ij}X_{ijt} \qquad [1]$$

Subject to:

$$\sum_{j=1}^{m}\sum_{k=t}^{t+dj-1} x_{ijt'} \leq a_{it} \qquad for\ i = 1,..n\ and\ t = 1,..24 \qquad [2]$$

$$x_{ijt} \leq \left(\prod_{k=t}^{t+dj-1} a_{it'}\right)S_{ij} \qquad for\ i = 1,..n; j = 1,..m, and\ t = 1,..24 \qquad [3]$$

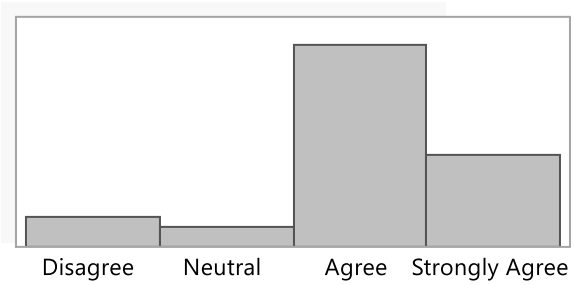
$$\sum_{i=1}^{n} x_{ijt} \times k_i \geq r_j \qquad for\ j = 1,..m\ and\ t = 1,..24 \qquad [4]$$

$$\sum_{i=1}^{n} a_{it} s_{ij} x_{ijt} = v_j \qquad for\ j = 1,..m\ and\ t = 1,..24 \qquad [5]$$

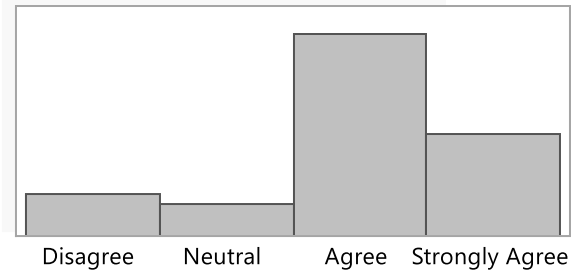
The objective function *[1]* minimizes the cost of assigning volunteers to tasks in the according time periods considering the distance volunteers must travel to begin the assigned tasks. The constraint set *[2]* ensures that the volunteers assigned to each task are available at the start time and throughout the duration of task *j*. The constraint set *[3]* ensures that the assigned volunteers have the required skills for their tasks. The constraint set *[4]* ensures that the assigned volunteers have sufficient capacity (e.g., seats on the registered vehicle) to serve the provided number of riders. Finally, the constraint set *[5]* ensures the assignment of the required number of volunteers to the tasks, while ensuring that these volunteers are available and capable of performing the task (i.e., have the required skills).

APPENDIX A2. SURVEY RESULTS

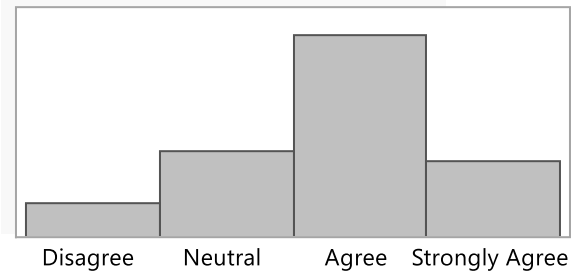
Q3.2: The process of registering (creating) my account is easy and understandable.



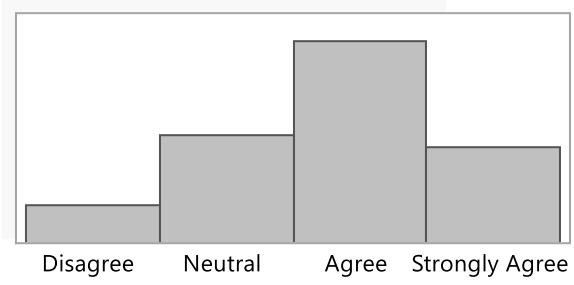
Q3.3: The process of adding my personal information to my profile page is easy and understandable.



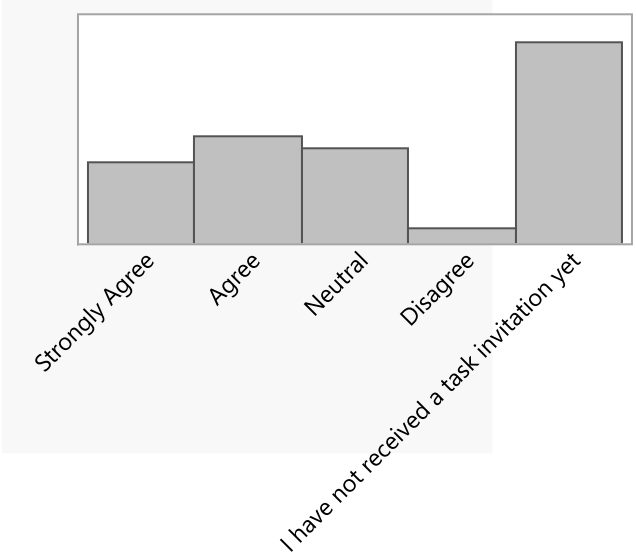
Q3.4: The process of adding my availability to my profile page is easy and understandable.



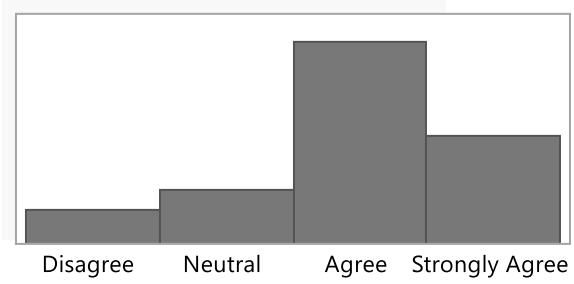
Q3.7: The process of checking whether I have a task invitation is easy and understandable.



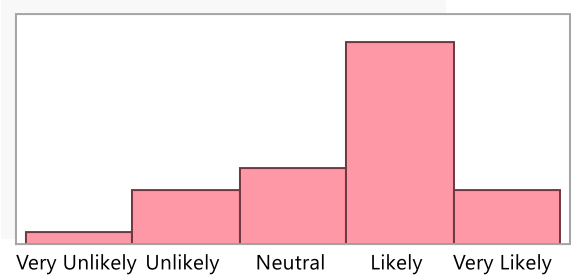
Q3.8: The process of accepting or rejecting a task invitation is easy and understandable.



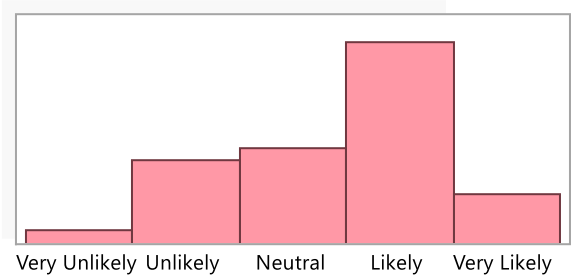
Q3.9: Navigating through the platform is easy for me.



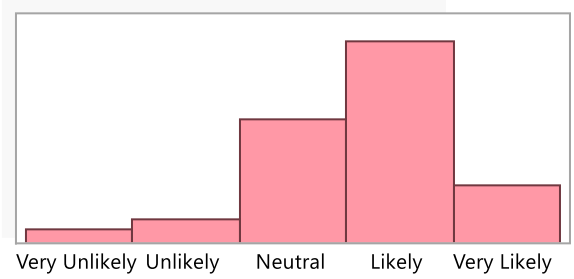
Q3.12: Using the Volunteer Platform would enable me to register as a volunteer for the transit agency.



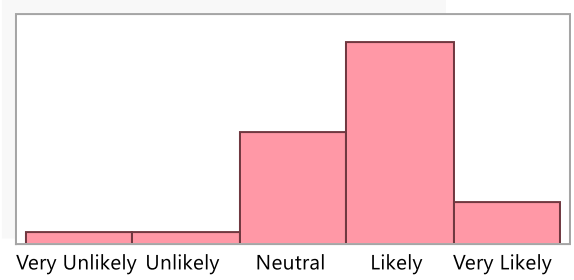
Q3.13: Using the Volunteer Platform would enable me to volunteer my time with the transit agency.



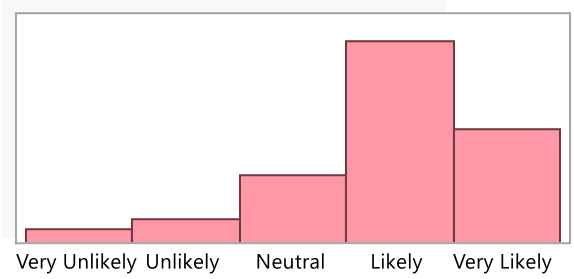
Q3.14: The use of the Volunteer Platform would help the transit agency attract volunteers.



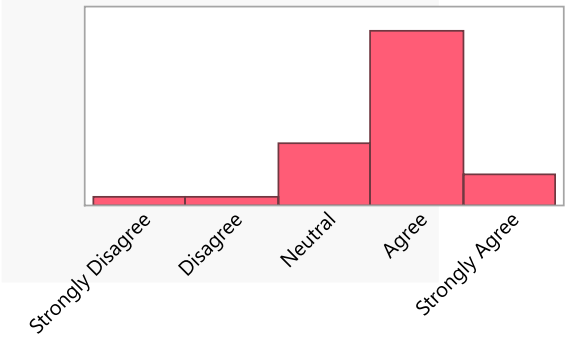
Q3.15: The use of the Volunteer Platform would help the transit agency recruit volunteers.



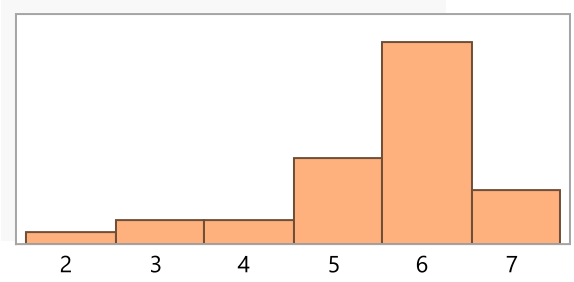
Q3.16: The use of the Volunteer Platform would help the transit agency coordinate volunteers.



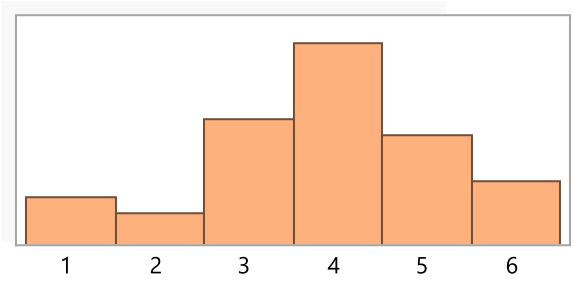
Q3.17: I find the Volunteer Platform useful.



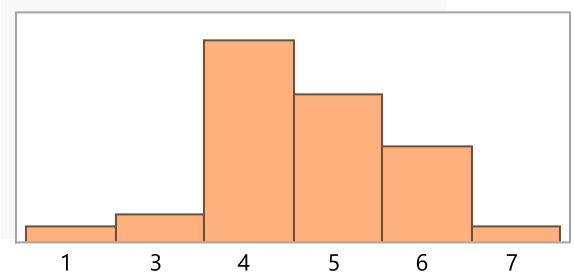
Q3.22.1: Using the volunteering platform is ____ (Responses 1: Inconvenient through 7. Convenient)



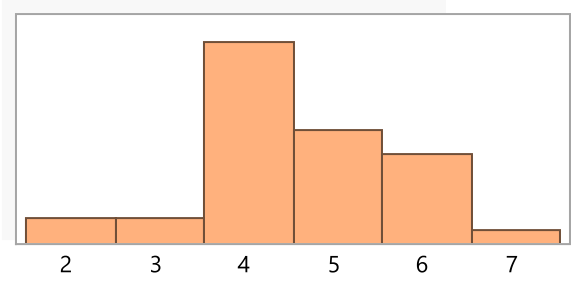
Q3.22.2: Using the volunteering platform is ____ (Responses 1: Boring through 7: Fun)



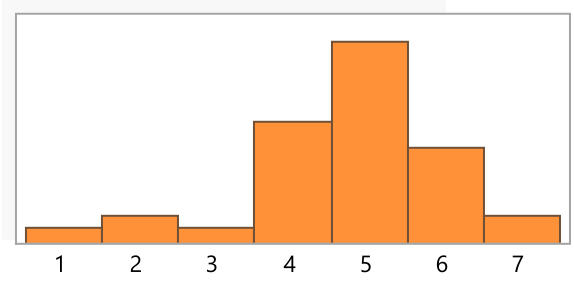
Q3.22.3: Using the volunteering platform is ____ (Responses 1: Unpleasant through 7: Pleasant)



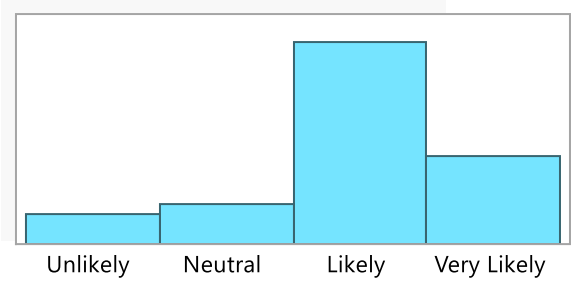
Q3.22.4: Using the volunteering platform is ____ (Responses 1: Painful through 7: Enjoyable)



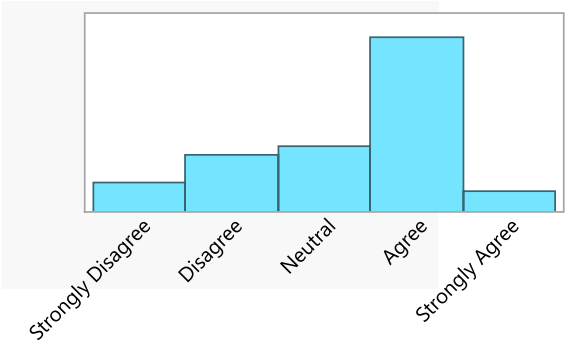
Q3.21: I ____ using the volunteering platform. (Responses 1: Extremely Dislike through 7: Extremely Like)



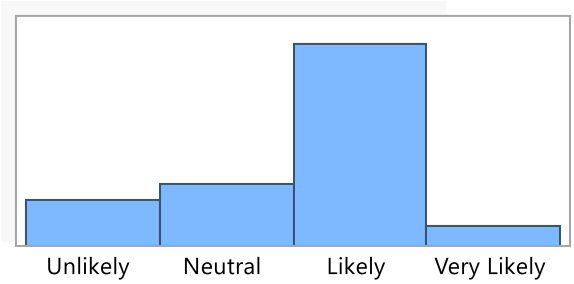
Q3.24: How likely is it that the Volunteer Platform will be a convenient way to volunteer?



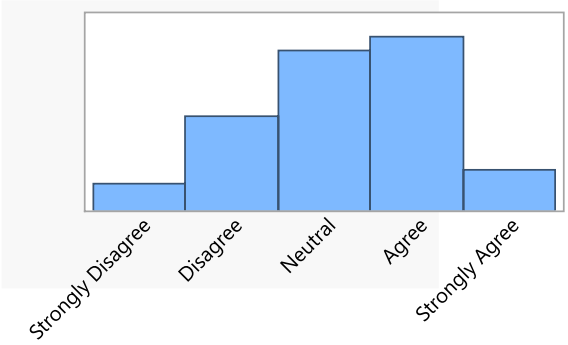
Q3.25: Having a convenient way to volunteer would enable me to start volunteering or to volunteer more.



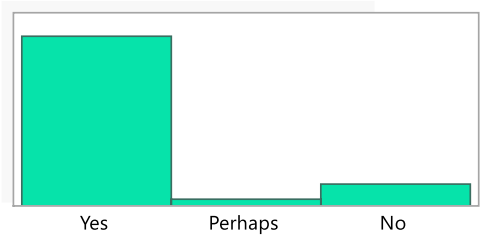
Q3.26: How likely is it that the Volunteer Platform will be a convenient way to engage with the transit agency?



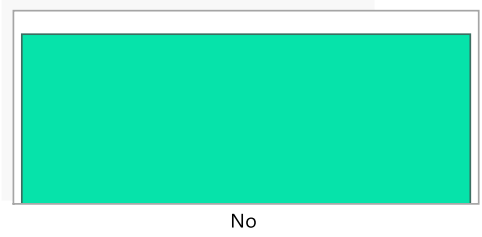
Q3.27: Having a convenient way to engage with the transit agency would enable me to start volunteering or to volunteer more.



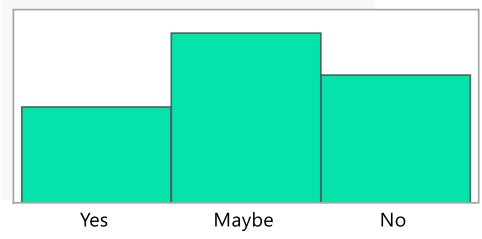
Q4.1: Have you ever volunteered with an organization?



Q4.2: Have you ever volunteered with a transit agency?



Q4.3: Would you ever consider volunteering with a transit agency?



APPENDIX A3. RECRUITMENT FLYER

JOIN OUR VOLUNTEER TEAM!

MOUNTAIN LINE TRANSIT AUTHORITY

Each day in **our community**, individuals need assistance getting to life-sustaining medical appointments, students need to get to class, and people have to get to work on time.

BENEFITS FOR YOU!

Resumé Enhancement
Flexible Scheduling
Skill Development
Community Involvement

REGISTER THROUGH OUR EASY TO USE VOLUNTEER PLATFORM AND START VOLUNTEERING TODAY!

SCAN ME

For instructions on how to register and start volunteering, go to tinyurl.com/TransitVolunteering

For more info on the platform and opportunity: dimitra.pyrialakou@mail.wvu.edu

VOLUNTEER OPPORTUNITIES:

- Survey Administration
- Shelter Inspection
- Volunteer Driving
- Other meaningful tasks that help us provide service!

APPENDIX A4: RESEARCH RESULTS

Transit IDEA Project 97

Research Results

Program Steering Committee:
TCHRP IDEA Program Committee

January 2024

Title: Open Platform to Attract, Organize, and Coordinate Volunteers for Rural and Small Urban Transit

Project Number:
TCRP J-04/IDEA 97

Start Date: 2/11/2020
Completion Date: 1/31/2024

Product Category:
Concept Exploration (Type 1)

Principle Investigator:
V. Dimitra Pyrialakou, PhD
Assistant Professor,
West Virginia University

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dimitra.pyrialakou@mail.wvu.edu
Phone:
(304) 293 9927

Open Volunteering Platform for Rural and Small Urban Transit Agencies

Developed an online prototype platform facilitating the recruitment, organization, and coordination of volunteers for their effective incorporation within transit operations.

WHAT WAS THE NEED?

Rural and small urban transit agencies in the U.S. face financial constraints, necessitating cost-effective solutions. Although volunteers can mitigate operational expenses and support the expansion and enhancement of transit services, challenges in attracting, retaining, and coordinating volunteers hinder their widespread use.

WHAT WAS OUR GOAL?

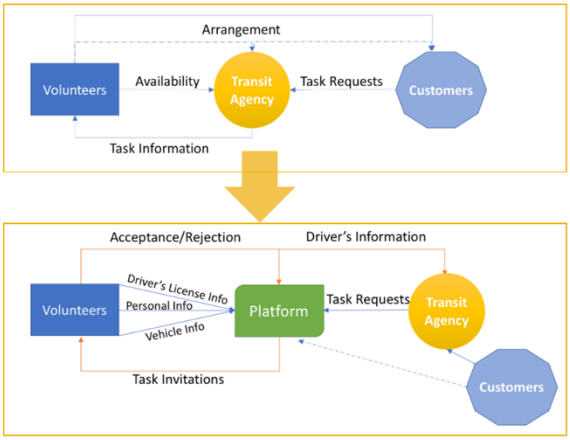
Our goal was to design, develop, and test a prototype online platform facilitating volunteer registration, organization, and coordination of volunteers.

Platform design conceptualization.

Person helping neighbor. Image: Freepik.com

WHAT DID WE DO?

- Conducted extensive research on transit volunteering practices, identifying a transition towards technological incorporation in agencies.
- Through this research and in collaboration with our partner transit agency, we identified the guiding design principles of the platform development.
- Developed and tested the two distinct components of the platform:
  - Interfaces: Designed two interfaces; one for volunteers and one for transit agencies.
  - Optimization Engine: Developed and integrated a mathematical optimization model.
- Evaluated and improved the platform by engaging key stakeholders and partners.
- Conducted beta testing and further refined the platform by addressing users' and stakeholders' input and system weaknesses identified through the testing process.



Conceptualization of the current (top) and proposed (bottom) coordination models.

WHAT WAS THE OUTCOME?

- Developed a functional proof-of-concept platform that streamlines volunteer registration, coordination, and task matching.
- The innovation aims to enhance the existing coordination model.
- Positive user feedback from beta testing highlighted the platform's usability and convenience.
- Stakeholders expressed strong interest, affirming the potential of a decision support system.
- Future steps include developing and testing a scalable platform for implementation and potential commercialization.

WHAT IS THE BENEFIT?

Expected impacts of adoption include:

- Enhanced recruitment, retention, and engagement of volunteers.
- Diversification and expansion of the demographic pool of volunteers.
- Simplified coordination and more efficient task assignment.
- Improved resource allocation and operational efficiency.
- Provision of personalized services and enhanced mobility for transport-disadvantaged populations.

LEARN MORE

To view the complete report:
http://tinyurl.com/TR-IDEA97