



Greater Minnesota

Public Transit

Technology Plan

References:

Peer Agency and Industry
Experts Interview Results,
Transit Agency Survey
Results

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1: Peer Review Findings

INTRODUCTION AND APPROACH

As part of the Greater Minnesota Public Transit Technology Plan, a variety of peer agencies and industry experts were interviewed. The objective of the peer review task was to interview agencies of varying sizes to learn about their approach to technology. Peer agencies were interviewed regarding their approach to implementing technology, including challenges or barriers to implementation, prioritization and lessons learned. The objective of the industry expert review task was to gain an understanding of trends in the transit technology industry and the resulting opportunities for transit agencies in Greater Minnesota and MnDOT.

The study team drafted a list of interviewees based on knowledge of the industry, then worked with MnDOT to enhance that list. Interview invitations were sent to agencies requesting 60-minute interviews. Table 1.1 below lists the interviews which were analyzed and further discussed in the narrative that follows. Interviewees were selected based on several criteria including:

- The study team’s knowledge of technology efforts the agency or vendor have are undertaking
- A recommendation by the MnDOT project manager
- A recommendation by an agency or vendor regarding an innovative partnership or project

When reaching out to interviewees, the study team sought out an information technology (IT) project or program manager, an executive director, or the individual(s) responsible for technology innovation projects, such as pilots, within each agency. The invitation described the project briefly, particularly the interest in their “technology stack” so the appropriate interview respondents could be identified. Through the interviews, interviewees noted similar sentiments with respect to how their organization could be more effective, how they make decisions about technology, and what their priorities and next steps are.

The interviews focused on specific rider-facing technologies such as trip planning, electronic fare payment, and schedule and dispatch tools, but were open-ended as well to invite the participants to share lessons learned. Because the study team heard several key themes across organizations, the insights are separated into two chapters. Chapter 1 focuses primarily on the key themes identified from the peer agencies. Chapter 2 is organized around technology trends and opportunities, and how agencies are using resources to research, plan for, and implement a technology program that aligns their needs with promising market trends and opportunities.

Table 1.1: Interview Participants and their Organizations

Interviewee	Organization	Role	Technology/Purpose
Ross MacDonald	Vermont Agency of Transportation	Public Transit Planner and Coordinator	GTFS-Flex and statewide trip planner
Ruth Miller	CalTrans	Product Manager	State-level support for smaller agencies
Matthew Barnes and Sarah Hackett	Oregon DOT	Transit Network Manager	Statewide GTFS and GTFS-flex data, statewide trip planner
Ryan Taylor	Utah Transit Authority	Coordinated Mobility Manager	Regional One-Call/One-Click, open source DRT system
Mindi Knebel, Megan Hannagan, Gillian Robinson	KaizenHealth	Technology/Partnership Project Manager for GO!Bus Pilot	HIPAA compliance; paratransit + NEMT brokerage as pilot with The Rapid, Grand Rapids MI
Steve Weekley	OATS Missouri	Executive Director	Statewide coordination: mature program that predates many existing technologies; offers DRT and deviated fixed routes
Cara Marcus and Liz Taylor	National RTAP	Project Manager - Tribal Training Director	General technology and training
Janet Geissler and Jean Ruestman	Michigan DOT	Mobility Innovations Specialist and Head of Office of Passenger Transport	Pilot planning, implementation and evaluation; innovative technologies
Tim Geibel and Kristin Arendash	CATA Pennsylvania	Executive Director and Planning Manager	Rural transit agency with 70 vehicles
Leo Frachet	MobilityData	Executive Director	Developing and maintaining GTFS specification
Ritesh Warade and Santosh Mishra	IBI Group	Director and Associate Director	State of practice for DOTs engaging with technology
Gabrielle Matthews, David Sherman, Chris Wiglesworth	Florida DOT	Research, Planning and Commuter Programs Division Administrator and Team	Statewide research, planning and programming perspective

Note: Other agencies that were not interviewed but were reviewed via TCRP reports included Lane Transit District in Oregon and the Flint MTA for their Rides to Wellness Program.

KEY FINDINGS

The study team consistently heard several messages from interviewees around setting goals, defining roles and performance standards, and understanding the full capabilities of the technology that currently exists.

These key findings are striking in that, while the technology may be changing quickly, the approach to introducing and **maintaining transit technology follows the trajectory of other transportation assets: understand the asset, take care of its components, support it with training, and make plans to replace or upgrade it.** In other words, many interviewees essentially recommended a program management approach for DOT and transit agency technology programs where the hardware, software, and data are all component assets

of the technology program. The following subsections elaborate on each of these key findings and offer examples and additional context for the peer agencies.

Key Finding 1: Goal Setting and Defining Champions

Summary: Having clearly defined goals is a critical first step, and champions are needed to communicate and advance those goals.

Multiple agencies noted that without a clear goal for what the technology brings to the organization, it is merely “innovation for the sake of innovation”. Understanding the technology or technology program and why it is needed is critical. This understanding should exist at all levels - from senior leadership at the DOT, to transit agency dispatchers, as well as the mechanics that might be involved with asset management tools. These individuals do not need to be actively involved in implementation, but each agency should have a “champion” for mobility and technology who can communicate with stakeholder groups.

Details: A consistent theme heard from peer agencies is that “champions” for mobility as well as technology are needed for several reasons, including:

1. Maintaining energy, focus and commitment on new projects, as was the case with several technology pilots in Michigan.
2. Understanding the capabilities of the technology tools, what kind of data the tools generate, and how that data can be used to inform operations, as was mentioned by CATA Bus in Pennsylvania as well as Cal-ITP in California.
3. Coordinating communication and updates/upgrades with technology vendors and the IT program manager, as suggested by OATS in Missouri.

The key message was that data and technology can help agencies find efficiencies within the organization, but that this requires someone to focus on finding that information precisely in order to replicate the processes. In California, a small team of product managers and data analysts is fulfilling this role statewide for the most critical technology components (e.g., APC or AVL), whereas a single agency could choose to have an in-house data analyst to evaluate all the data being generated by every piece of technology (e.g., fleet management, scheduling and dispatching, and fare data).

Having goals around technology and champions who are assigned the responsibility to understand and manage that technology was noted as one way to avoid “innovation for the sake of innovation.” Several peers noted that they do not want to buy something if they cannot justify a need for it. Defining the goals and a role for the technology helps provide a check that every component is bringing value to the enterprise. This goal setting might also involve setting a schedule and budget for replacement, e.g., where a state technology program seeks to replace 30% of a specific type of equipment each year based on available budget, in order to bring all transit agencies up-to-speed.

Florida DOT recently published a Transit Technology Primer on their website. It defines a process to vet new technologies and filter out what technologies are needed and useful to transit agencies in the state. Many transit agencies are solicited by a variety of vendors and have no way of knowing whether technology products are useful, or what their track record is in terms of implementation in the state or other places.

Key Finding 2: Performance Measures and Work Plans

Summary: After setting goals, performance measures and work plans should be regularly maintained. Goals, performance measures and work plans will help an agency craft the right approach to procuring, implementing, upgrading, or retiring technology throughout its lifecycle.

For day-to-day software tools: Tools can be flexible and remain most useful if there is a process in place to evaluate technology performance and adjust software program settings to meet evolving needs. Just as there needs to be a champion to communicate, there should be staff who understand the full capabilities of the tools in order to ensure they are being used to their full potential (and that potential is high if goals were set prior to procurement).

For pilots and demonstrations: Keeping a close eye on performance measures and work plans will keep demonstration projects on track and avoid scope creep. It gives technology project managers something to point to when vendors are struggling to meet the schedule or requirements and provides a clear decision-making framework for ending a pilot or formalizing it as a permanent program.

Details: Interviewees noted the importance of having work plans where other roles and responsibilities are clearly defined. In addition, performance measures are needed to describe how success will be defined and measured. –Interviewees also noted that leadership needs to be flexible and adopt a learning mindset. Thus, the workplans and metrics should build in opportunities to document learning and adapt to changes while being a resource that staff can use to build on in the future.

So how do agencies build structure into a fast-changing technology landscape, akin to building a bus as it drives down the road? Below are some strategies that different peers used:

1. Michigan DOT took on the role of facilitator for a series of statewide pilots (which they funded), found that projects with defined milestones and benchmarks were the most likely to stay on track.
2. Centre Area Transportation Authority (CATA) Bus, a rural transit agency of demand response and fixed routes in Pennsylvania with roughly 70 vehicles in the fleet, has a data analyst with a clear job description: the analyst's role is to understand data and how it can be used to track performance. This additional role also allows CATA to communicate more effectively regarding the value of transit with the transit board, local councils, and the public.
3. The DRCOG Ride Alliance project in Denver, Colorado benefits from having a diverse group of stakeholders overseeing project direction. The group defined functions that a trip brokerage software system must be able to fulfill, and the project has built and tested components of that tool. When specifications were defined by this group and a technology vendor was not able to develop the resulting API, the steering committee was able to cancel that task order and issue it to another technology vendor who could deliver the specified tool.
4. California Department of Transportation (CalTrans), through the California Integrated Travel Program (Cal-ITP) worked with a vendor to survey hundreds of agencies statewide to understand how key technology components fit together. Their vendor compiled the key technologies that agencies need to fulfill their mission - and they are in the process of defining the requirements, specifications, and data produced by those technologies so they can understand the “technology stack” that California’s rural and small urban agencies need. This will allow Cal-ITP to establish these preferred pieces of equipment (based on requirements and specifications). By vetting the equipment, California can offer it to any agency in the state via a “transit store”.

Key Finding 3: Opportunities for Collaboration

Summary: Keep an eye on opportunities for coordination that align with agency/provider goals.

Transit is a complex program that could also set an example for using data for other modes and programs, as Cal-ITP intends to demonstrate. Some state DOTs found it beneficial to work with other offices or bureaus in their DOT, to capitalize on ITS, safety or other programming. *Such collaboration is not a necessary element* but keeping the broader DOT and transit agencies statewide informed at a high-level can generate opportunities for collaboration and an understanding for the value organized data can bring to the agency. Other examples would be to keep a running list of grant deadlines and encourage transit agencies or other agencies to partner for FTA and FHWA grants that support the “complete trip”. There may also be opportunities to invite FTA, universities, or other research organizations to do an independent evaluation of MnDOT and RTCC programs.

Collaborating with other agencies, departments, or universities was not always a primary ingredient, but the relationship between the DOT and other agencies was a common component that peers noted as either a **success factor** in their project *or* as a **longer-term goal or outcome** of their technology undertaking. Collaborations can help build economies of scale that are important for transit service productivity. After setting goals and having performance measures in place, agencies could use those metrics and goals to have conversations around collaboration. There are several types of collaboration that we heard about: across geographies, among and within agencies, and finally with other groups like universities or regional hospital systems.

Details: Several state DOTs and others interviewed participate in informal monthly roundtables. The National Rural Transit Assistance Program hosts roundtables for rural and tribal transit agencies, with the topic selected a few weeks in advance and informed by prior roundtables. Cal-ITP also hosts monthly roundtables with agencies statewide, where the topic for subsequent sessions is discussed and selected at the end of each meeting. During the last few minutes of the call, the organizer asks what topics the group is interested in discussing, and if anyone is willing to share their experience on that topic. This format helps to build shared understanding around best practices and trends. The roundtables could also invite vendors to do demonstrations or develop topics for Requests for Information, such as Cal-ITP’s “market soundings.”

GEOGRAPHIC COORDINATION AND COLLABORATION

When peers referred to geographic coordination, they were typically referring to publishing their service information in GTFS or with geofences in a geographic information system (GIS). Sharing information about service geography can enable collaboration by allowing agencies in a region to see one another’s service areas and discuss opportunities to partner on providing service or even common fare systems.

INTER- AND INTRA-AGENCY COLLABORATION AMONG TRANSPORTATION AGENCIES

The Cal-ITP is allied with Caltrans’s Division of Rail and Mass Transit. This was a strategically selected partnership with a big vision to use underutilized data and organize processes around the insights from that data. Cal-ITP is meant to demonstrate what an integrated system/program could look like, and then take those lessons to other parts of the organization, such as to show how data and technology management could improve snowplowing operations statewide. In this way, the demonstration is happening first, and then the collaboration is expected to come from the demonstrated value. *This approach mirrors what other peers have suggested - that to make a collaboration happen, potential partners may want to see a program in action before jumping on board.*

Another inter/intra agency collaboration opportunity may exist in the USDOT [Work Zone Data Exchange](#) specification. This work zone specification is intended to make roads safer and share information with the public as well as owners/operators of infrastructure. Demonstrating how specifications like this provide value to primary as well as secondary stakeholders was mentioned as a method of demonstrating the value of coordination, collaboration, and data specifications at the enterprise level (for the DOT as well as the transit agencies that would use the information for planning).

COLLABORATION WITH NON-TRANSPORTATION PROVIDERS/AGENCIES

Finally, several collaborations were mentioned between a DOT or transit agency and local universities, hospitals, or the municipality. There are different ingredients and motivations for such collaborations, such as:

- Research partnerships with universities to explore new, innovative programs or technologies
- Partnerships with research organizations like the National Renewable Energy Laboratory (NREL) or USDOT’s Accessible Transportation Technologies Research Initiative (ATTRI)
- Partnerships between healthcare providers and a transit agency, such as Rides to Wellness in Flint, Michigan. This partnership emerged because the healthcare provider saw the branded vehicles around town and reached out to the agency to learn how they could get involved.
- Relationships with vendors may be formed as a partnership as opposed to a contract, depending on how contracts are designed.

For several of these partnerships, cost allocation is an important consideration. Peers noted that it can be difficult to develop a five-year cash flow calculation for a new idea, but one approach to demonstrating the value to inform future cost allocation is to emphasize the *savings* that could result from such a partnership. Lane Transit District in Lane County, Oregon initiated coordination and software projects to streamline NEMT in 2000, and the Rides to Wellness program in Flint, Michigan began in response to a need for diabetes transportation in 2015 and grew to serve customers in response to the Flint Water Crisis. Both of these are examples where a sustained program with demonstrated benefits has led to additional opportunities for cost sharing and collaboration as the programs have matured.

Key Finding 4: Fundamental Building Blocks and TBD Tech

Summary: Technology is evolving quickly but getting fundamental building blocks in place – and maintaining them – should be an ongoing activity.

Many agencies are experimenting with new tools such as vehicle-pedestrian detection via a smartphone or piloting electronic fare payment. Even in this last FTA grant cycle, several awards were given to agencies for piloting integrated fare payment. There is still much to learn and there could be consolidation of vendors in this market in the next 3-5 years, which is an added challenge for procuring when long-term sustainability of the tools is a concern. However, there are several “building blocks” firmly in place (or far enough along in development) which MnDOT can put in place now to start seeing benefits statewide. These are briefly discussed in this chapter and will be elaborated on in the final report.

Details: Technology is evolving quickly, but there are some fundamental building blocks that agencies can confidently put in place, potentially with the support for the state DOT. These key building blocks include items such as:

1. **Business rules and oversight** regarding training, insurance, eligibility, asset management and background checks mandated by the FTA and other funding/governmental requirements.

2. **The family of GTFS data**, which is recognized as the standard in the United States for trip discovery or planning. This includes the static GTFS fixed route information, GTFS-Realtime for arrival predictions, vehicle positions and service advisories, and GTFS-Flex for demand response or flexible route services.

There are other areas where software and hardware requirements are yet to be determined, such as the Transactional Data Specification for Demand Responsive trips or fare payment integration and mobility wallets. These are being explored through pilots and will likely offer many lessons learned in the coming years. Cal-ITP is undertaking a major initiative to address electronic fare payments, providing leadership in this area. In the meantime, peer agencies were confident that actions they take around business rules and instituting GTFS data would be time well spent.

We know from experience nationwide that customers want flexibility and real-time information about their trips; with this customer need in mind, many agencies have experimented with ADA-compliant “alternative services” where an agency can contract with ride-sourcing or taxi companies to provide a same day service. A TCRP project¹ is underway to evaluate these programs, but they are fundamentally based on business rules around driver training, insurance and reporting to the funding or sponsoring agency. Agencies can use their existing call center and route trip requests via whatever means the contracted, non-dedicated vehicle providers are comfortable with. Agencies that establish detailed business rules that meet funding and eligibility requirements can achieve the flexibility and real-time information that customers desire, even though widely available scheduling and dispatching technology, and often at a higher cost since they are choice programs and thus not subject to the fare rules for comparable fixed route service.

A few key findings related to these fundamental concepts from the interviews include:

- GTFS is a necessary first step and can enable so much in terms of trip planners and coordination. GTFS can help regional mobility managers and even transit agencies define their service. This will be discussed in more detail in Chapter 5.
- Transactional Data Specifications are in development, with several agencies piloting services based on exchanging information. Over the next 12-24 months, the study team anticipates that lessons around business rules and minimum specifications will be learned and hopefully available to the broader transportation planning community. Some pilots or efforts to watch include:
 - Ride Alliance in Denver, Colorado
 - MnDOT and the consortium of transit agencies in Southeast Minnesota who were awarded a FY20 AIM grant from the FTA. One aspect of the project is to carry forward the Transactional Data Specification (TCRP Report 210) mentioned previously as part of a broader mobility platform.
 - MobilityData, a non-profit which leads the development of GTFS and is working to develop a General Operations Feed Specification (GOFS) for on-demand services
 - The GO!Bus pilot in Grand Rapids, Michigan - a partnership between The Rapid, KaizenHealth, Lyft, and others.
- It is critical to have staff who understand the technology and tools, including how to configure software so it supports their mission, and the need for staff support to assist with implementation at a regional or agency level (potentially as 10% or 20% of an FTE).
- Eligibility verification is a large undertaking requiring coordination. Lane Transit District in Oregon

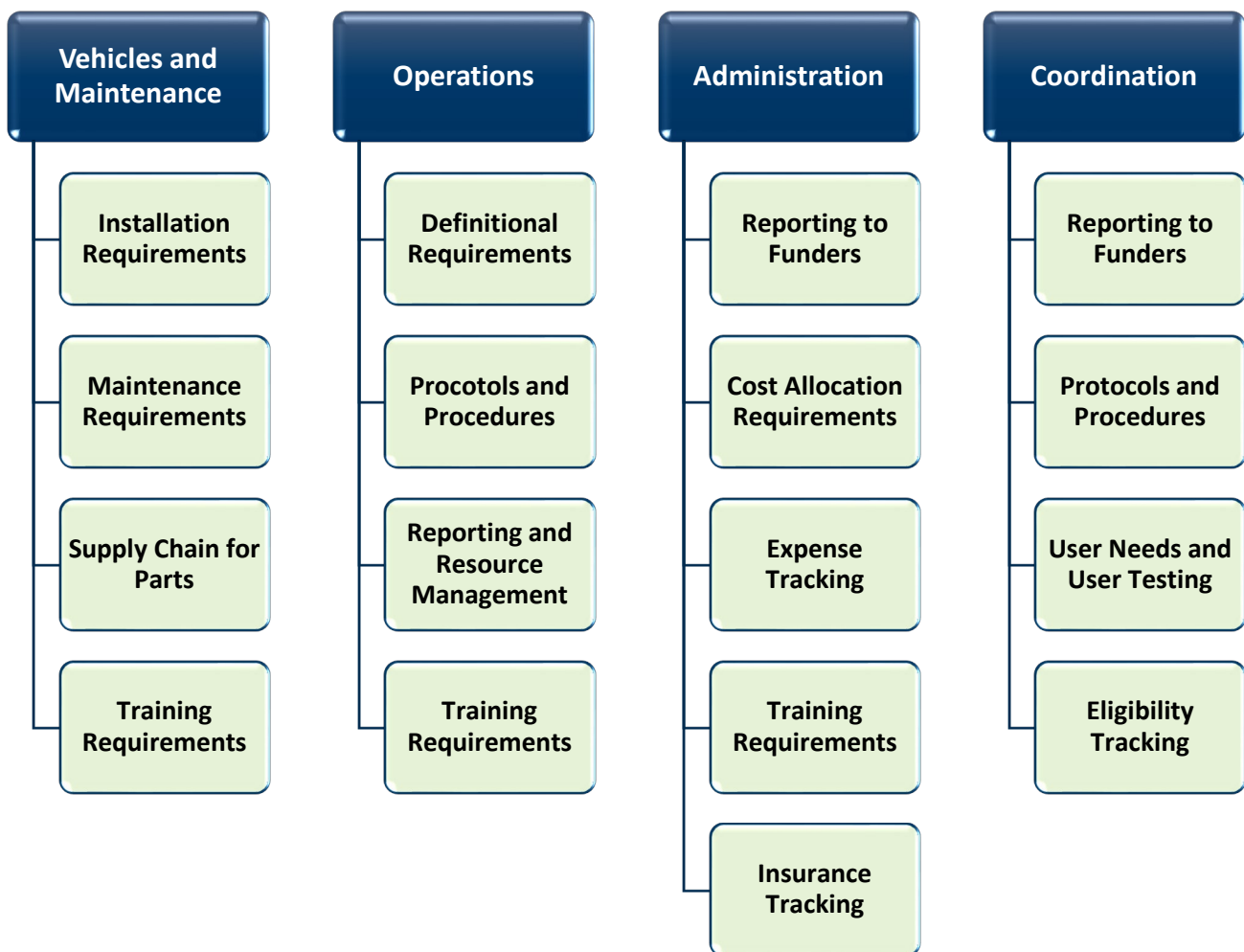
¹ TCRP B-48: The Provision of Alternative Services by Transit Agencies: The Intersection of Regulation and Program <https://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=4883>

manages eligibility in a central database, where the software facilitates eligibility determination for all programs at one time. Cal-ITP is working with the California DMV to automate eligibility and deliver something beneficial to smaller agencies.

- The Oregon DOT hosts a technical resource center as a tool for support and building blocks for planning, collecting technology information and training. It is also a tool for connectivity, where transit agencies can go to understand how to use their data to make planning and operating decisions.

Finally, several peers alluded to a need to recognize the end user - not only the transit customers, but also the bus maintenance team who will be installing and maintaining any technology components (CATA, Seattle and LA fare pilots and readers, Star Metro Token Transit pilot in Florida). A maintenance team needs to figure out where to mount new fare equipment or a tablet mount in a vehicle, or to know of a vendor they can use to install these. In research produced by the Eno Center for Transportation, some transit agencies have ultimately made a new pilot service free for riders when they experienced difficulties deploying new technology in vehicles, either for equipment problems or data/connectivity issues and to thank them for their patience. Complications are a fairly common part of an implementation. Understanding the life cycle and implementation of technology is a critical component of the fifth key finding.

Figure 1.1 Considerations for Functions in Procuring Software



Key Finding 5: Sustainability of Costs and Technology

Summary: The technology program must have a plan for sustaining data and covering ongoing costs.

Several worthy pilots were cancelled because the cost of the service or application was not sustainable. On the other hand, one very successful pilot (Rides to Wellness) was sustained, and the program managers give much credit to the fact that they set a price that covered operating costs. While new services or technology may cost more than existing programs, often agencies determine that the added cost is worth it in terms of employee or customer convenience, *so long as it is meeting clearly defined goals as described in Key Finding 1*. The path to a sustainable cost model might include a diversity of funding sources, centralized leadership, strong coordination at the state or regional level, statewide procurement strategies, or working with a group of transit agencies on cost-sharing and cost-allocation models.

Several agencies (state and transit agency) also had a full-time staff person devoted to data analysis for continuous improvement. Vendors noted that maintaining clean, accurate data is a time-consuming and important undertaking that serves as the foundation for any technology program.

Details: From goal setting and user needs analysis, to procurement, installation, and implementation – the longer-term work of sustaining technology to deliver service emerged as a key consideration. Peers noted that the ability to sustain a program financially was a big consideration, and when not addressed early on, meant some pilot programs were ended. Sustaining the equipment and data that supports service delivery was identified as one which needs to tie back to technology program goals and staffing.

Key considerations for financial sustainability and maintaining a technology program include:

- **Calculate the cost to provide service**, and price it appropriately. This is more relevant to technology-enabled opt-in “alternative service” programs that an agency might offer to ADA-eligible customers as a same-day service, but also apply to how agencies might work together to determine cost allocation.
- **Maintaining data is an ongoing process**; both vendors and agencies noted that an agency must have people who understand tools and data who can stay up to speed and educate others.
- **Technology can generate more opportunities for cost sharing** - if a plan/approach is in place to track those costs and enable partners to get onboard, such as for Lane Transit District or instituting a One-Click system.
- Peers warned to **avoid technology that breaks easily or is simply a waypoint on the path to the bigger goal** - procurement should be cautious because some technology can be a big investment and long-term commitment. Equipment operability, maintainability, and maturity are all important considerations; Cal-ITP and OATS in Missouri both mentioned this as a challenge and having a “minimum specification” or requirements for procurement (e.g., to be placed in the CalTrans Transit Store) could make this process easier.
- Transportation agencies will need **ongoing assistance**. Things are changing rapidly and there need to be resources they can go for continuing education, and also opportunities for feedback. Venues for that feedback could be advisory committees or the state Public Transit Association. At the transit agency level, having staff expertise and “institutional knowledge” of the purpose and outcomes of any technology tools is important.
- Developing a **common understanding of timelines for procurement and grants** is critical. When does the agency get to make decisions and enter into new contracts? How can the state support them when there is a decision to be made? Peers in California, Florida and Pennsylvania all mentioned that having

someone at the DOT whom transit agencies could call as a resource when they have questions is part of a successful technology program.

PEER AGENCY CONCLUSIONS

A consistent theme was that peers are approaching customer-facing and back office technology by considering technical as well as human/staffing considerations. The picture that emerges from these interviews is one of a program management approach to technology, where the programs move cautiously and deliberately to form partnerships, develop contracts, and identify opportunities coordination. This deliberation enables strong decisions that can support the fundamental blocks. At the same time, several peers noted that having flexibility pilots is very valuable - and this agility can be achieved when there are (1) clear goals, (2) project champions, and (3) strong technical and operational building blocks in place.

A clear and almost unanimous finding was that procurement was being managed at the state level by those states leading in technology development. Oregon, California, and Pennsylvania agencies all noted that the state can play a pivotal role in defining minimum specifications and getting a “bulk deal” on technology. This statewide coordination can also support interoperability, as OATS and PennDOT have achieved with their Ecolane implementations.

The need to maintain clean, quality data is important, and agencies often have a full-time employee devoted to it. Several peers noted that having more templates for reporting to the state DOT (be it for fleets, grants or trips) would be beneficial. For pilots, it is common in the industry to develop documents including a Concept of Operation, Pilot Test Plans, and Program Evaluation plans. Having business rules and templates for operations and evaluations can simplify decision-making and generate lessons learned to share more broadly.

As technology continues to evolve at a fast pace, several agencies noted a desire to be flexible. Michigan DOT noted that when they took on the risk of several pilots, that gave transit agencies space to be creative and innovative without fear of failure. Balancing the need for solid foundations while remaining flexible is a challenge; the model that emerged from peers was one where understanding and applying critical, fundamental pieces – such as key technology components needed in every technology stack, “failsafe” technology like GTFS, or eligibility and business rules – can provide that solid ground for agencies to innovate around. Having a common understanding of software, hardware, business rules and reporting requirements can allow planners and operators to see where opportunities for improvement may lie, e.g., a simple business rule adjustment might prove as beneficial as an expensive software procurement.

2: Trends and Opportunities

INTRODUCTION AND APPROACH

The goal of this chapter is to articulate the most salient ways in which technology impacts or will soon impact the transit industry. Sources of information included the interviews described in Chapter 1 as well as state of the practice research and project reports. Table 1.1 in Chapter 1 listed the interviews which were conducted. Focus areas for the interviews and review of the literature included not just the direction of the technology, but how organizations and state departments of transportation are responding to these trends. The study team determined DOTs', vendors' and agencies' needs and activities around technology trends that fall into three categories:

1. **Data and Technology Tools:** Specific **trends** related to data, standards, and Software-as-a-Service. These are trends and opportunities in how agencies are defining the role of data and specifications for technology tools.
2. **The need for support.** Interviewees continually referenced the needs of maintaining data, understanding technology, and organizational capacity as key challenges. This section defines **trends** in how DOTs or agencies approach training or on-going support for their program/tools/staff.
3. **Technology Program Definition:** There are different approaches to innovation. While pilots are part of many agencies' approach to evaluate and implement new technology, they are still usually part of a program.

DATA AND TECHNOLOGY TOOLS

The Centrality of Data

Technology and data are two intertwined forces that are rapidly transforming the larger society and transit's place in it. Technology, most recently through the proliferation of cheap networked sensors known as the Internet of Things (IoT), has made it ever easier to collect copious amounts of data. In turn, the increased availability of data generates a demand for better technology to put it to use for competitive advantage. With technology platforms and business models built with data at their center, Uber and Lyft have played a significant role in capturing the popular imagination with the promise of easy access to mobility options to anyone with a smartphone and some financial means.

That promise has set expectations to which the transit industry must respond. The public understands that technology can provide opportunities to compare travel options, book, and pay for trips. They would like this convenience and the ability to use multiple modes. This is the vision of **Mobility as a Service (MaaS)** and a successful MaaS implementation integrates available transportation options into a single platform with on-demand trip planning, real-time information, and integrated payment for seamless end-to-end journeys.

Data management in transit is not new. Computer-aided scheduling and dispatching has been in common use for decades. What is new is the expansion in real-time vehicle tracking accelerated by the delivery of granular service information to riders. Presenting internally generated data to the public present new challenges to agencies: if riders are to rely on it, the quality and availability of the data must be high, higher than usually required for internal uses.

Public transit agencies throughout the U.S. face an array of other issues related to data and integrated payment that Cal-ITP market soundings are addressing. Equity is a core value in transit service delivery so all riders must be served, including those who are unbanked or do not have access to a smartphone. Many riders are also eligible for discounts or to have trips paid for by government programs. For agencies to implement integrated fare payment, there need to be revenue sharing agreements and the quality of data again needs to be very high.

Transit agencies using technology create a surprising amount of data, from automatic passenger counters to AVL to fare and ticketing information. It is important to understand how and why an agency might share their data. Sharing internal data might improve customer information. Agencies also need to treat data with respect and understand the risks of sharing. "[TCRP Report 213: Data Sharing Guidance for Public Transit Agencies Now and in the Future](#)" (2020) describes two models for data sharing:

- **“Public Data Sharing (Open Data).** Data is shared publicly in an online data repository or dashboard through an Application Programming Interface (API) or in a public-facing report. These sharing models promote transparency and can spur innovation, but they cede control over how the data is used.
- **Private Data Sharing.** In a private data sharing agreement, data is shared with a specific partner, often with a nondisclosure agreement. These types of sharing models can enable transit agencies to meet targeted goals.”

In response to this seismic shift in how data are acquired, analyzed, and shared, the entities we interviewed have made a range of responses:

- Centre Area Transportation Authority in northwest Pennsylvania has hired a data analyst to standardize information across its departmental functions, such as planning and maintenance.
- The Oregon Department of Transportation (ODOT) and the Vermont Agency of Transportation (VTrans) provide direct funding for the creation and maintenance of GTFS feeds for all transit agencies that do not do it themselves.
- The ODOT has also developed an open source [transit network analysis tool](#) and has recently received a \$480,000 [FTA grant](#) to develop a “version 2.0” of the system.
- As part of its California Integrated Travel Project (Cal-ITP), Caltrans has hired a data scientist tasked with discovering what data already exists within the agency and making it available in new ways that provide insights and generate enthusiasm for sharing more data.

Increasing Role for Open Data and Data Standards

As noted above, there is a clear and growing trend towards putting more and more transit data into the hands of the general public. This cannot be achieved at scale without standardized methods for getting service data from transit agencies into trip planners and ultimately mobile devices. There is a clear trend towards expanding the use of open data and data standards. For example:

- The majority of transit agencies that produce GTFS feeds release them publicly under terms that make them readily usable not just for commercial trip planners, but also researchers, planners, and advocacy organizations.
- Caltrans recently released its [Minimum GTFS Guidelines](#) to establish for both transit agencies and vendors of the expectations the state has for publishing high quality transit data.
- MobilityData, in collaboration with Caltrans and other agencies, is developing both a software tool for validating GTFS feeds and a grading system for evaluating the elements of a GTFS feed that cannot be assessed except by a human being. These efforts are aimed at streamlining the creation and maintenance of GTFS data as it is used by smaller and smaller agencies around the world.

- GTFS-flex, which provides a computer-readable way to describe flexible transit services, has recently become a formal extension to the GTFS standard. The flex extension enables the full range of transit services to appear in rider-facing trip planners as well as services planning and analysis tools that have historically only supported fixed routes. Also, in the development are extensions to describe complex fare structures, eligibility for specialized transportation, stop and station pathways, and vehicle amenities and limitations.
- The Transportation Cooperative Research Program recently released [Report 210](#), proposing a transactional data specification for demand-responsive transportation. Implementation of this specification opens the door to a level of operational coordination of specialized transportation services that has thus far proved elusive in large part due to the absence of streamlined methods for exchanging trip request information between agencies.

Limited Integration Between Vendors Despite Broader Technology Trends

Technology has developed to solve specific problems. In the transit industry, software to schedule and dispatch trips, to ‘cut’ fixed-route vehicle runs, and to manage vehicle maintenance were some early developments. Each system was developed as a stand-alone solution. Over time, what were once single-focus software programs have expanded to become comprehensive systems that meet multiple agency needs. For instance, scheduling software for demand response services has expanded to include vehicle management, driver management, and trip cost allocation to funding sources. Through this approach, a transit agency has one vendor with a complete “end-to-end” software solution comprised of a core system with optional “modules” designed to work together. Under this approach a transit service agency can select the functionality required to tailor the system as a whole to their unique operational conditions and needs.

Because most technology is developed through private industries with no concerted demand from transit agencies for interoperability between vendors, a vendor who has developed one complete solution has few business cases for designing their software to readily interconnect with other vendors’ solutions. Some integration has been carried out, such as with Automatic Vehicle Location (AVL) and other on-board hardware. Outside of these limited cases, most incumbent vendors have been slow to transition their offerings and business models away from end-to-end offerings.

By contrast, the broader technology industry is moving swiftly toward more modular software that can communicate and work with other software or technology applications through documented system-to-system interfaces. A modular approach has several advantages for the purchasing agency. It allows for a transit agency to choose the technology functions that best meet their needs, and it allows for changing just those portions of a system that need updating rather than the entire system. In addition, a vendor that specializes in just one domain and makes it easy for their solutions to exchange data with third-party systems may be better equipped to provide a “just right” solution over one that attempts to have expertise in every facet of agency operations. Finally, the risk of vendor lock-in diminishes when an agency does not rely upon one technology provider for all aspects of what they do.

Recent entrants in the transit technology marketplace are embracing open architectures, providing the opportunity for agencies to opt for a more diversified technology footprint. For example, an agency may use one vendor for scheduling and dispatching and another for asset management while having both connect to the same on-vehicle data source for tracking the vehicle’s location and status. Such opportunities must be weighed against the costs of managing multiple vendors and integrations between systems.

Software as a Service

With Software as a Service (SaaS) now the predominant model for software, comes the need for agencies to expand their competencies and infrastructure in new areas. The shift to hosted (or “cloud”) computing means that staff need to understand security risks on the internet or risk data breaches. It also means that while application uptime may approach 100% at the data center, access to that application can be interrupted by a transit agency’s slow or unreliable internet connection. If the application is mission critical, agencies wishing to enjoy the benefits of SaaS will need to make sure the underlying ingredients for success are in place.

THE NEED FOR SUPPORT

Difficulties Building Organization Capacity for Technology

All interviewees described challenges with regards to managing transit-specific technology and the new demands for managing data. These challenges were found to be most pronounced at departments of transportation, whose role has mainly been that of grant management entities. Shifting to becoming an actor capable of effectively supporting both its own technology efforts and those of transit agencies requires the acquisition of significant new competencies such as:

- Database administration and maintenance, including understanding of security and permissions
- Data analytics and an understanding of how analysis of different data sets can answer key questions and achieve transit agency goals
- Knowledge of privacy risks and techniques to preserve privacy of data pertaining to individuals

At Caltrans’s Cal-ITP program, the most ambitious ITS effort of all those evaluated through interviews, bringing technology skills into the organization has been achieved almost entirely through independent contractors. There is no labor classification for software developers within Caltrans. Similarly, capacity at Oregon DOT has been built through contracting and partnerships with the state’s public universities.

On-Board Technology is Expected but Often Poorly Supported

On-board networked and GPS-enabled devices and their associated back-end systems are now considered by many to be mandatory for any transit agency. They enable a wealth of information to riders, dispatchers, drivers, and, if connected to vehicle computers and asset management systems, fleet managers. Putting such systems in place as quickly as possible can seem like a “no-brainer” for many smaller agencies that do not yet have them. The prevalence of this technology and the seeming obviousness of its utility mask a range of costs and challenges that may not be apparent to the agency until after it is procured. While agencies generally maintain these tools, showing that the benefits outweigh the costs, it is useful to be aware of costs ahead of time.

- Connectivity issues, especially in rural areas, can significantly hinder the usefulness of on-board devices.
- Training of drivers can be more difficult than agencies anticipate. Drivers who are not used to working with tablets may resist using them.
- The tooling and services to maintain such technology systems (e.g., updating the underlying operating system when a security vulnerability has been found) is often lacking, especially for smaller and more rural agencies. The IT support services agencies have to maintain workstations and network infrastructure often do not have the expertise to support Android-based tablets in vehicles.

Understanding the total costs of on-board technology systems, along with the real-world benefits, will result in a better ability to maintain the systems and use them to their full potential.

Centralization and Contracting to Manage Complex Technology

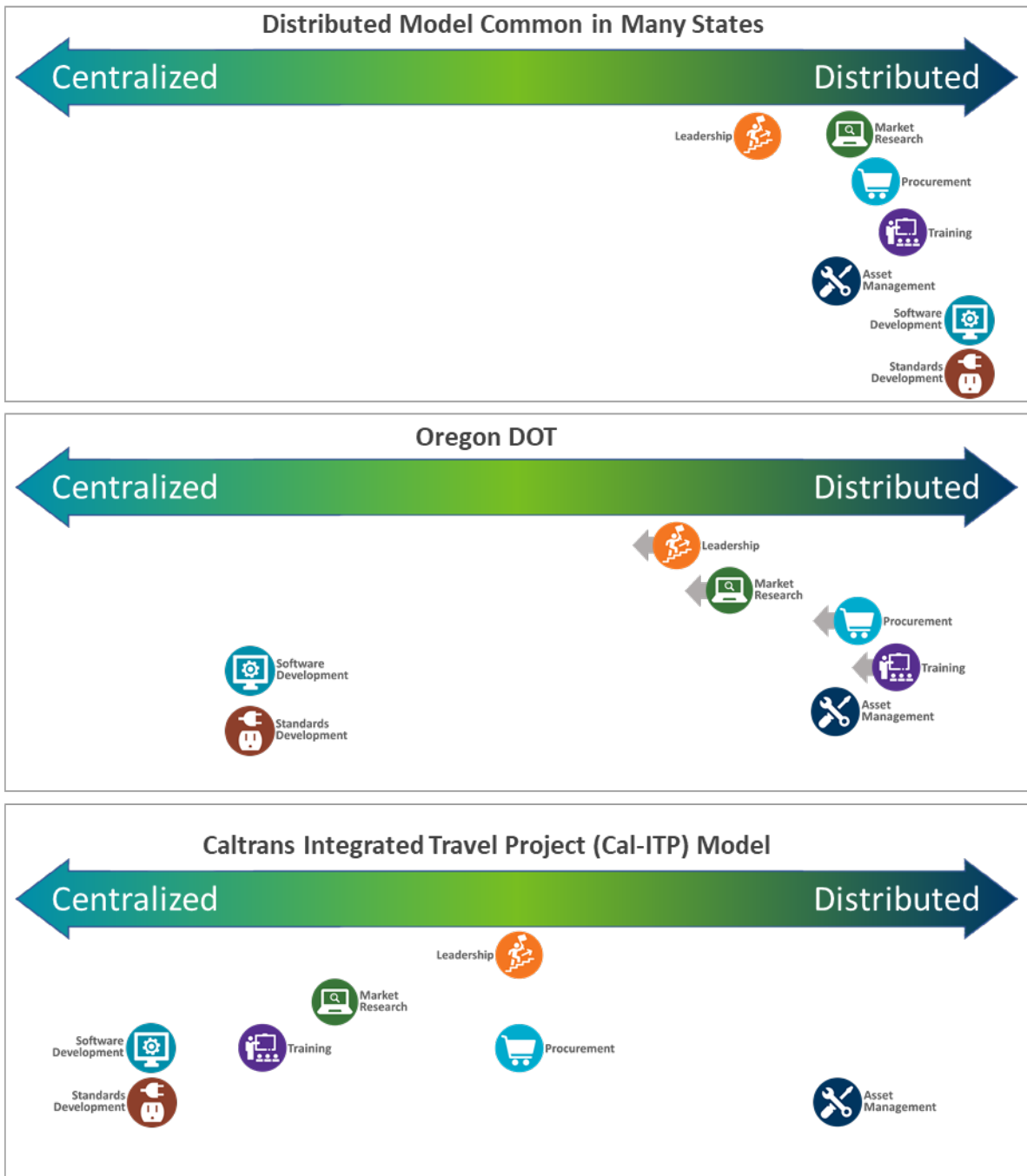
One impactful characteristic of transit ITS is how highly specialized many key components are. Specialized technology requires specialized knowledge throughout its life cycle—from procurement to implementation and on to maintenance. Acquiring and retaining the resources to manage a quickly evolving yet arcane set of skills can prove to be a daunting undertaking for any organization, but it is especially so for smaller transit agencies, where staff turnover needs to be considered.

To succeed with more demanding technologies, we found multiple examples of state departments of transportation assuming a greater role to assist smaller transit agencies to address the challenges of deploying specialized transit technology. For example:

- Caltrans is working to make technology procurements easier and less risky by creating a “transit store” of vendors who provide solutions that meet minimum requirements established by the State. The minimum requirements are developed through research into industry best practices in areas such as data standardization and interoperability between technology systems.
- Caltrans is also exploring centralizing software by managing a single instance of an [open-source real-time arrival prediction system](#) and making it available to transit agencies across the state.
- UTA uses a contractor to continuously upgrade and maintain an open-source software program (RidePilot) that provides scheduling and program management to very small and volunteer driver services in their large service area. UTA also received an FTA grant to develop an e-voucher application for these entities.
- Oregon DOT supports the creation and maintenance of GTFS feeds across the state through a contract with a single vendor. Other DOTs do this as well. In a similar vein, Oregon DOT also provides access to Remix, a web-based transit planning application, for all transit agencies it funds.
- PennDOT procured a single scheduling and dispatching system for transit agencies of general public dial-a-ride transportation across the entire state, excepting Philadelphia and Pittsburgh.
- Nebraska DOT conducted a Request for Qualifications for vendors of scheduling software through a procurement that met Federal standards and included standard pricing. They enabled any agency receiving FTA funds to purchase software from these prequalified vendors, held a technology fair, and supported the agencies in purchasing the software that best meet their needs. Approximately ten agencies purchased or renewed contracts with four different vendors in the first six months after this prequalification.

These examples of centralization lower the barriers that smaller transit agencies encounter when attempting to use sophisticated transit-specific technologies. Samples of different state models are included in Figure 5.1. In these samples, “centralized” refers to State-level management, while “distributed” indicates areas managed directly by each transit agency. It should be noted that while the figure focuses on State and transit agency activities, there is opportunity for other actors, such as RTCCs and regional governments.

Figure 2.1: Models of Centralized versus Distributed Technology Functions



TECHNOLOGY PROGRAM DEFINITION

The trend is that DOTs wishing to encourage the development of transit technology among their subrecipients are evaluating and modifying their programs in response to the needs they see.

Some DOTs Are Serving as Risk Mitigators

Adopting technology, especially newer applications that reflect emerging trends, is inherently a risky venture. Even proven technology systems can have uncertain outcomes when applied to previously untested contexts such as rural settings. For these cases, state-level support can provide a way for agencies to try things out that may otherwise be deemed too risky.

- As an agency serving mostly rural areas, VTrans relies heavily on small pilots to assess whether a given technology will work in the state. Recently, in the last few years, VTrans has used small pilots to evaluate GTFS-flex, real-time vehicle location tracking, electric buses, and replacing low-productivity fixed route lines with on-demand micro-mobility services.
- As described in Chapter 1, Michigan DOT assumed the risk for pilots it funded in a recent state-funded grant program.

No Single Approach to Program Structure

Institutional responses to the growing role of technology vary widely with local conditions and leadership:

- Vermont has prioritized discovery of rural transit services through the creation of GTFS-flex feeds for all its general public dial-a-ride and the updating a multimodal trip planner (OpenTripPlanner) to make it capable of creating itineraries that included those services.
- Pennsylvania has taken a strong role and implemented a single scheduling and dispatch system across rural Pennsylvania. The choice to have a single system is largely due to a need for consistent per-trip compensation to agencies from the lottery funding that supports a large segment of rural and specialized transit across the state.
- Caltrans is prioritizing equity and environmental outcomes through market-based approaches that can be feasibly scaled out to the state's 300+ agencies.
- With its relatively small scale, Oregon DOT has focused its efforts on a role no other actor plays: Understanding and improving the statewide network through collecting, analyzing, and distributing data about transit services throughout the state.
- In Missouri, OATS Transit adopted a strategy of centralizing most of its information technology (IT) and intelligent transportation system (ITS) functions, allowing it to simultaneously modernize, increase consistency across the state, and manage costs. In Utah, UTA has taken a similar approach for its large service area that covers a 120-mile corridor along the Wasatch mountain range.

These examples serve to illustrate that there is no single solution for how to employ technology in rural and small urban transit. Rather, there are a multitude of challenges, and responses depend on local conditions, local resources, and local leadership defines and prioritizes the challenges it seeks to overcome.

CONCLUSIONS AND OPPORTUNITIES

The rapid ascendance of mobile computing and data-intensive business models means that transit agencies of all sizes have been called upon to dramatically “up their game” for customer-facing technology, data management, and integration of disparate systems. Large and medium-sized urban transit agencies are managing this shift but are often doing it without a well-defined framework. For Tribal, small urban, and rural agencies and the organizations that support them, the barriers to success are markedly higher, to the point where support is needed to get on track. New vendor pricing and support models known as software as a service (SaaS) do assist agencies in responding to this new data-hungry environment and frees them from the burden of managing servers and upgrades. They still need to have the organizational capabilities to select, implement, and maintain technology and effectively manage the data produced, even if this support resides with another entity.

In response, the study team observed several DOTs building capacities on behalf of the agencies they oversee. Each state is carrying out this work uniquely, based on their particular leadership, resources, mix of transit agency sub-recipients, and priorities.

Opportunities for State DOTs

There are recurring areas where DOTs have opportunities to advance technology amongst their transit agency partners. Doing so builds a foundation and framework for transit agencies to build out their individual technology systems. This would involve MnDOT evaluating both where it makes sense to take a stronger leadership role and determining the approach to actions in each area.

- Procurement, ranging from creating more functional processes to establishing functional standards and pre-qualifying vendors
- Coordination and knowledge sharing by providing venues for agencies to learn from one another’s activities and build peer relationships
- Creating and maintaining service-related data through creation of GTFS feeds where they do not presently exist or are burdensome on the agency to produce
- Providing easy access to technical assistance, ranging from training to on-call support to consulting services
- Centralizing highly specialized technology applications that can easily scale to a state level. Examples include trip planners, one-click websites, and systems that produce real time arrival estimates

The power of DOTs to coordinate the agencies, provide technical assistance, manage risk, and establish technology expectations for the statewide transit network mean that they are at a unique position to influence the success of technology for smaller agencies that otherwise would likely be left behind by today’s technology trends.

3: Transit Agency Survey

INTRODUCTION

Online Survey

This report includes the results from the online survey of public transit agencies, also referred to as providers, organized by topic and question number. Comments related to each topic are included as well. The base data is available, by request, in a searchable Excel spreadsheet. Similarly organized by topic (and sometimes including several questions), this database has been provided separately to MnDOT.

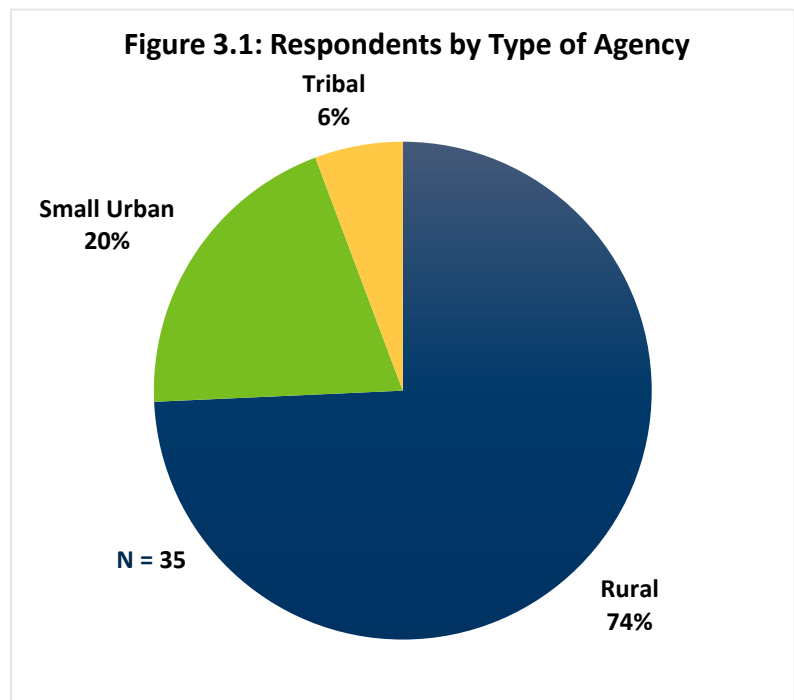
The survey was distributed online, using Survey Monkey. A copy of the survey can be found at the end of this report. A letter introducing the project and requesting participation was sent from Charles Morris, MnDOT Office of Transit and Active Transportation Technology Coordinator, on July 30, 2020. A copy of that invitation can be found on the next page. An email inviting survey participation was distributed on July 31. A follow-up email was sent August 6 and individualized follow-up emails were sent August 13 and 19. Additionally the transit systems were reminded to complete the survey August 17 and 20 during the N-CATT Technology Summit held August 17-20.

Responses

The survey was sent to a total of 42 transit agencies in Greater Minnesota (30 rural, 5 tribal, and 7 small urban). There were 35 total responses for an overall response rate 83%. The percentage of responses from each type of agency are illustrated in Figure 3.1.

A total of 35 valid responses were received (26 rural; 2 Tribal, and 7 small urban). This does not include agencies that started the survey but only answered a few identifying pieces of information no responses on content questions. Only the Tribal transit organizations had a low response rate (40%).

Not all agencies answered every question. Where the number of responses is less than 35, it is listed in the data responses.





From: Chuck Morris, MnDOT Project Manager, Office of Transit and Active Transportation
To: Minnesota rural, Tribal, and small urban transit providers
Re: Greater Minnesota Public Transit Technology Planning Project
Date: 30 July 2020

I'm writing today about an exciting new planning project and the critical role that you play in shaping the decisions.

Purpose and overview: The purpose of this project is to work with rural, Tribal, and small urban transit providers throughout Greater Minnesota — to develop a Greater Minnesota Public Transit Technology Plan. The Plan will build on MnDOT's recent collaborative development of 5-year Transit System Plans. It will support and also draw from the Technology Summit meetings August 17-20, 2020.

Key project components:

- Assess and evaluate completed transit technology planning activities
- Work with key stakeholders to define a statewide transit technology vision
- Collaboratively identify technology goals and objectives
- Research other systems and trends to build an understanding of options for technology investments
- Produce a Greater Minnesota Public Transit Technology Plan

Plan development process: MnDOT has hired TransitPlus, a consulting team with expertise in transit technology, to work with all key stakeholders to develop this Plan by April 2021. TransitPlus will directly engage all of you *and* work with a Steering Committee of providers that will help coordinate and support the engagement and Plan-development process.

As a key stakeholder, you are critical to this process. The project needs information, insights, and feedback from all of you to ensure the Transit Technology Plan meets the needs and will benefit providers, users, and Minnesota as a whole.

Your contributions are essential and the work is starting immediately. In the next week, watch for an invitation from the consulting team to participate in an online survey to identify existing technology and learn how you're thinking about technology. Your prompt response on this survey will provide baseline information for the Technology Summit as well as information that will guide the Transit Technology Plan.

Please share your perspectives, offer ideas, and ask questions – and both the consulting team and MnDOT promise to keep you engaged and informed from the beginning to the end of this project.

Primary contacts: All project communications will include contact information specific to that task or activity; below are the overall project leads:

- MnDOT project manager Chuck Morris, charles.a.morris@state.mn.us, 651-366-4178
- TransitPlus project manager Suzanne O'Neill, suzanne.transitplus@gmail.com, 303-646-4319

Many thanks in advance to all of you helping ensure this Greater Minnesota Public Transit Technology Plan reflects your issues and priorities and helps us all better meet the transit needs of Minnesotans.

Charles Morris, Data Management Coordinator
395 John Ireland Blvd, Ms 430 | St. Paul, MN 55155
Office 651.366.4178 | Fax 651.366.4192
Charles.A.Morris@state.mn.us

Lessons Learned

Some lessons were learned in the writing and distribution of the survey. First, the initial distribution list included the nine Regional Transportation Coordination Councils (RTCC). It was discovered that because of the transit agency focus, it was not meaningful for the RTCCs. It was decided to delete their responses (most were partial) and follow up with a focused group discussion.

Transit agencies from some bi-state systems also had some difficulties in answering some questions. Often when something was not answered, it was because the local administrator did not know the answer. The bi-state systems are MatBus (Moorhead, MN and Fargo, ND), Cities Area Transit (East Grand Forks, MN and Grand Forks, ND), Apple Express (La Crescent, MN and La Crosse, WI) and Duluth Transit Authority (Duluth, MN and Superior, WI). MatBus and Cities Area Transit are large systems that provide a significant amount of comprehensive service within Minnesota. La Crosse provides only limited service in La Crescent, MN and Duluth Transit Authority provides only limited service in Superior, WI. Whether responding to questions regarding the number of paratransit vehicles operating in the Minnesota side or specifics of software to track employees or maintenance activities, the person responding to the survey did not have that detailed knowledge.

Refining Data

The data was cleaned to delete duplicate entries, errors, and incomplete surveys. It was also cross-checked with website information and National Transit Database reports from 2018. This enabled some blanks to be filled in - for example, some mobile apps and trip planners were identified.

This process also identified one other area where there was some weak data. The survey asked about the modes of service operated and asked for data about each (such as fleet size and ridership) to provide context for understanding the type of technology that would be useful. Many respondents did not complete this detail or there were differences in how they answered the questions. Bi-state agencies did not break out the portion of their services in Minnesota. As a result, some of the service information is not as complete and useful as it might have been.

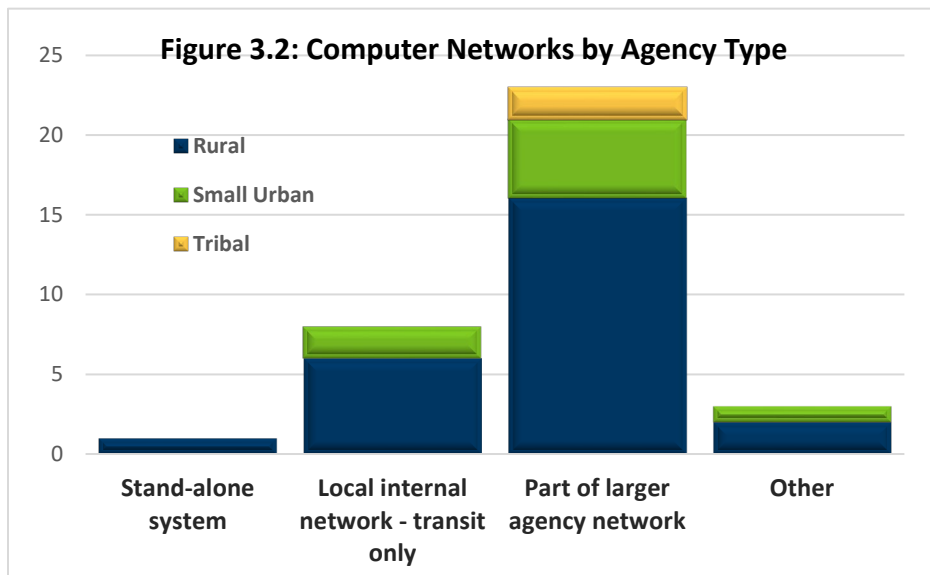
The following sections are based on the refined data and include the questions asked and responses received.

BASIC INFORMATION

Computer Systems

Do your computer systems:

- Operate as a stand-alone system, not connected to a network (i.e., files are shared via email, thumb/flash drive, or similar)
- Operate as part of a local, internal network only for transit services (i.e., files are shared using a shared folder either through an onsite or cloud-based server)
- Operate as part of a larger agency computer network such as a city or county
- Other



Responses are shown above, with a total of 35 responses. Three rural agencies submitted the following comments:

- The City has a large computer network, but the 3rd-party vendor has a standalone computer
- Operate as part of a larger organization computer network for transit and other services
- Director's office connected to network for file, dispatch office is standalone system with some cloud storage.

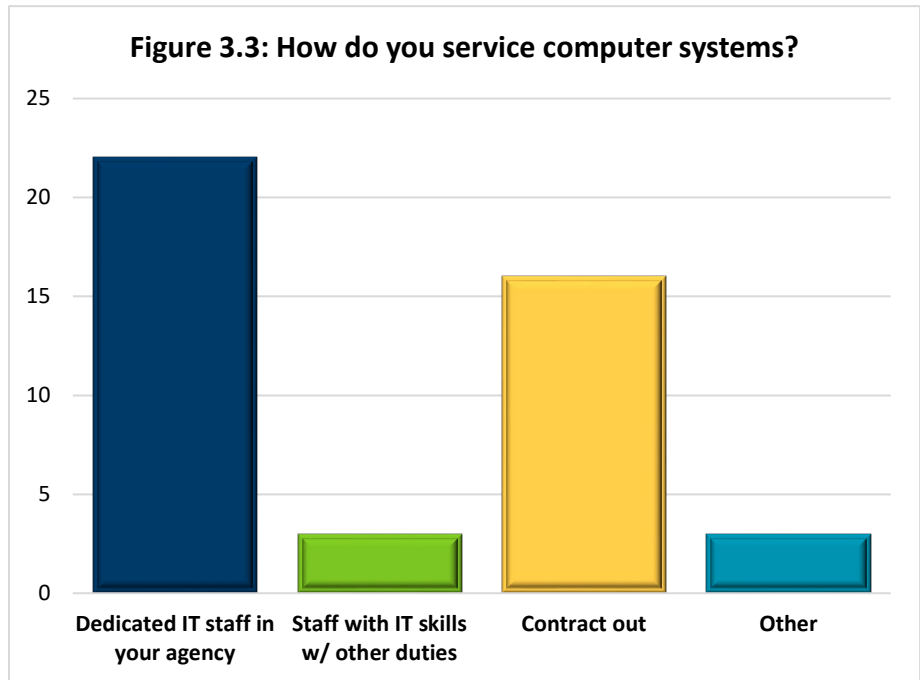
Servicing Computers

How do you service your computer systems? (Choose all that apply and explain as needed in the comment section)

- Dedicated IT staff in your agency
- Staff in agency who have IT skills and other responsibilities
- Contract with an outside IT organization
- Other (please describe)

Because multiple responses were allowed, a total of 44 responses were received from 35 agencies.

As shown in Figure 3.3, many used a combination of staff and contractors.

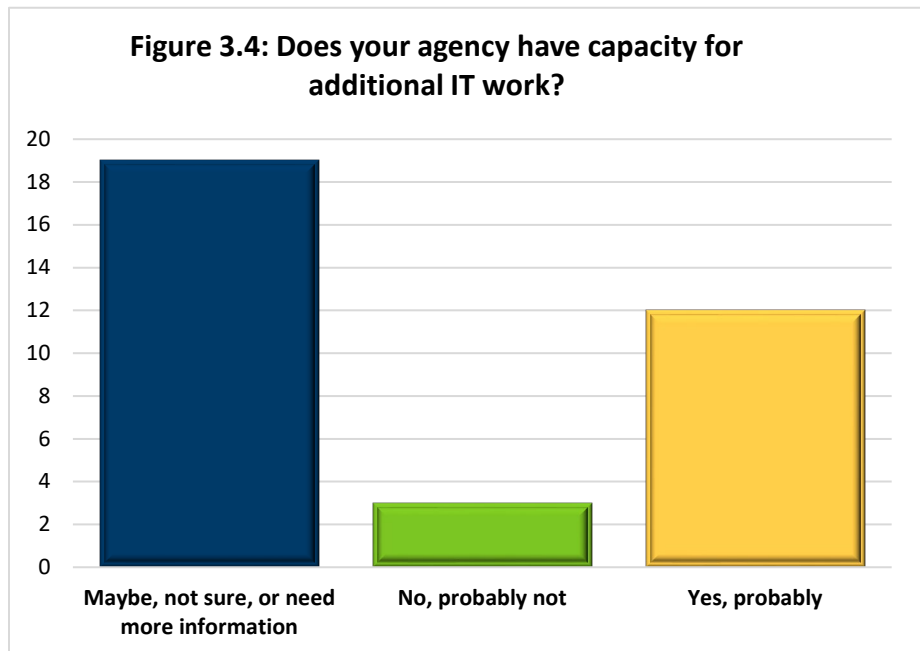


How much capacity do the people who service your computer system have for additional work? This could include helping implement new software, etc.

- Yes, probably
- Maybe, not sure, or need more information
- No, probably not

Comments:

- IT Staff at County, not specifically our department
- We use Compudyne; I'm not sure how our 3rd party operator (Shubat)
- One member county's IT department assists with IT needs as needed.
- IT Specialist that is an employee of the City of Saint Peter
- County IT-In Kind
- A Director of IT and a Network Administrator are employed.



Security

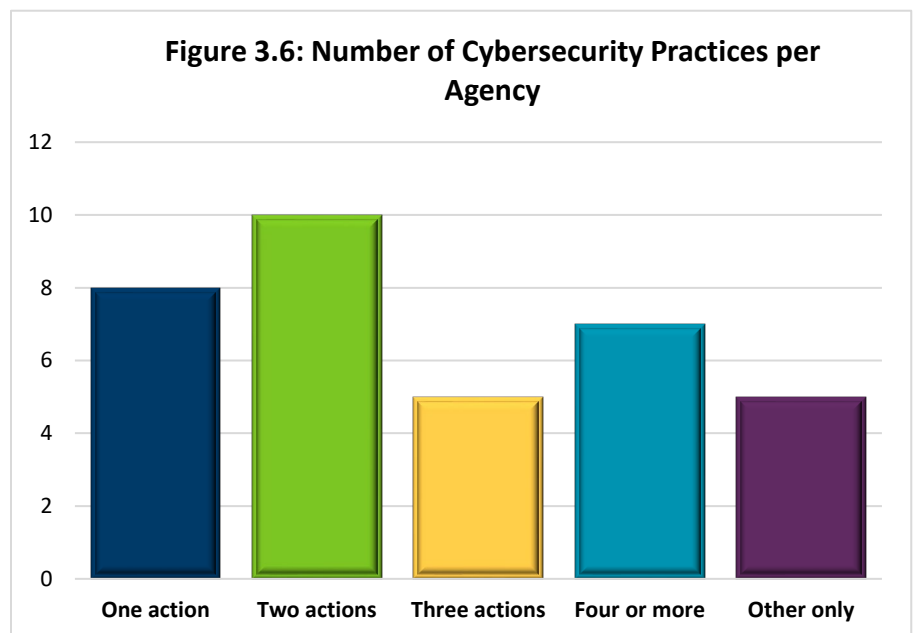
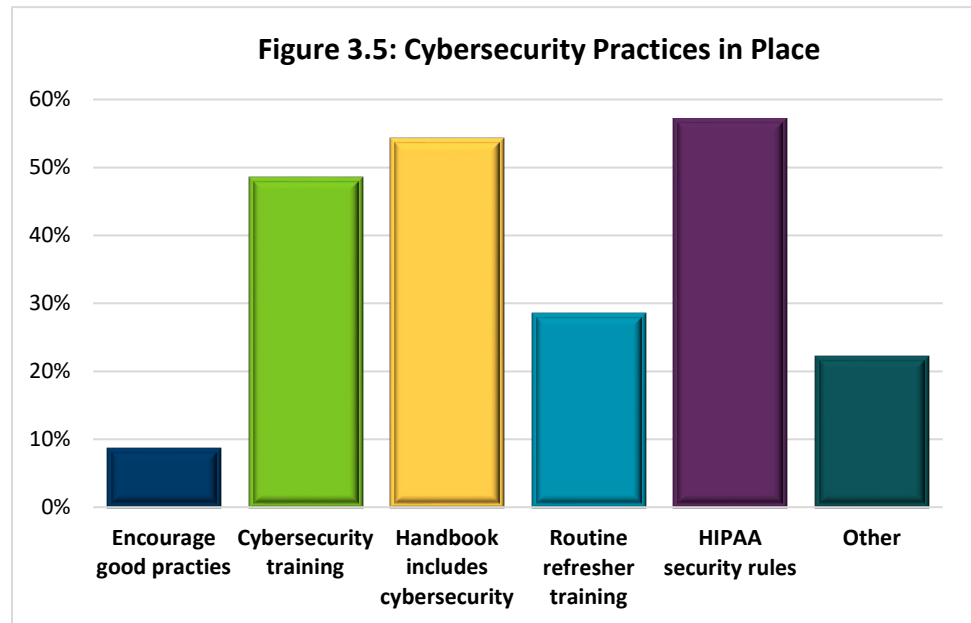
What security measures are in place for your computer system? (Choose all that apply)

- No formal system in place, although we encourage the use of good practices
- Provide cybersecurity training for all employees
- Employee Handbook includes cybersecurity requirements, guidance
- Provide routine refresher training
- Follow HIPAA security rules
- Other: (please describe).

Figures 3.5 and 3.6 illustrate the answers. Figure 3.5 shows the percentage of agencies with any given practice in place. Figure 3.6 shows the number of practices in place by agency.

Comments and other arrangements are listed below.

- County policy, training and installed software
- We rely on Compudyne to maintain our security
- IT staff runs tests on employees' compliance with not clicking on bad links
- IT department develops protocols for network security.
- Firewalls, anti-virus
- Data Practices and confidentiality policies
- We do not have any new employee training, however we do conduct periodic online cyber security training through Marco and our IT staff.
- County IT Dept. manages all security protocol
- Our contracted IT monitors the network for issues.



- Very tight Firewall with permissions on folders. Narrow ability to access websites online.
- Asked MnDOT OTAT PM for guidance on HIPPA over a year ago - no response yet.
- County Policy and Procedures
- UCAP uses Barracuda email security and Zix for confidential document sharing.
- We have an agency intranet protected by proxies and a firewall, and each computer has Malwarebytes Premium installed and regularly updated.
- Dedicated IT has anti-virus and other software programs installed on all computers.
- We have policies in place but no training nor audit of practices and shared information.

Technology Successes

Transit agency	Technology successes: What aspects of your technology infrastructure are working well?
Arrowhead Transit	We have a strong redundancy program for our servers, internet connection, dispatch phone system, and remote access to internal software/databases and dispatching tablets located on the buses.
Brown County Human Services	Security
Central Community Transit	Being able to share files between 3 remote locations. Team Viewer for employees working from home.
Chisago - Isanti County	File Sharing and joint drive
City of Brainerd	Cloud based Routematch and VPN remote office
City of East Grand Forks/Cities Area Transit	Having dedicated IT staff
City Of La Crosse MTU	Servers have been updated and the workstations are refreshed in a timely manner as budgets allow.
Community Transit of United Community Action Partnership	UCAP has satellite dispatching offices that share the same scheduling software and data. Most data that is shared is real time.
Duluth Transit Authority	Integrating applications, working towards less work.
Fond du Lac Transit	Computer Network Remote Access Wireless Connectivity
Friendly Rider	Seems smooth. Not a lot of Staff Complaints
Hibbing Area Transit	Our Accounting software - Tyler Technologies Incode - works well. It keeps track of our expenditures and revenues with useful reporting tools. Our network works well and our access to the internet is fast. We have no issues with using BlackCat or e-mail communication
Kanabec County - Timber Trails Public Transit	Our IS department is very good. Our dispatch software is far too expensive for the service that we provide to the community.
Mankato Transit System	Financial and fare collection
Minnesota River Valley Transit	Branch VPN linking remote office
Prairie Five CAC, Inc. (RIDES)	Maintaining and Troubleshooting of the system are seamless.
Prairie Lakes Transit	In vehicle tablets for manifests but even those aren't always used properly by drivers meaning more verification of rides on the back end done by hand.
Productive Alternatives, Inc.	Our dispatching system seems to be working well.

Transit agency	Technology successes: What aspects of your technology infrastructure are working well?
Rainbow Rider	We have been able to maintain a good cycle of replacing equipment as it ages, and in doing so we had very little issues with equipment failure and downtime. We also have a very reliable ISP which helps immensely with downtime. In recent years we have been able to digitalize our shop inventory and our timekeeping systems. This has helped in several ways for bus maintenance and optimization of workloads.
Rochester Public Transit	Installed Double Map that provides an interface with the public.
Semcac/Rolling Hills Transit	All good but additional servers needed and offsite storage
SMART Transit	We have a great IT person who helps out when needed - Is a great resource.
Three Rivers Community Action	We have a very knowledgeable tech admin who knows the ins and outs of the system to keep everything working as smoothly as possible. Our staff in transit is well trained in our current software.
Trailblazer Transit	Two offices are linked together
Tri-CAP Transportation	Having a dedicated IT Specialist for the Department
Winona Transit	City supports new technology and training

Technology Challenges

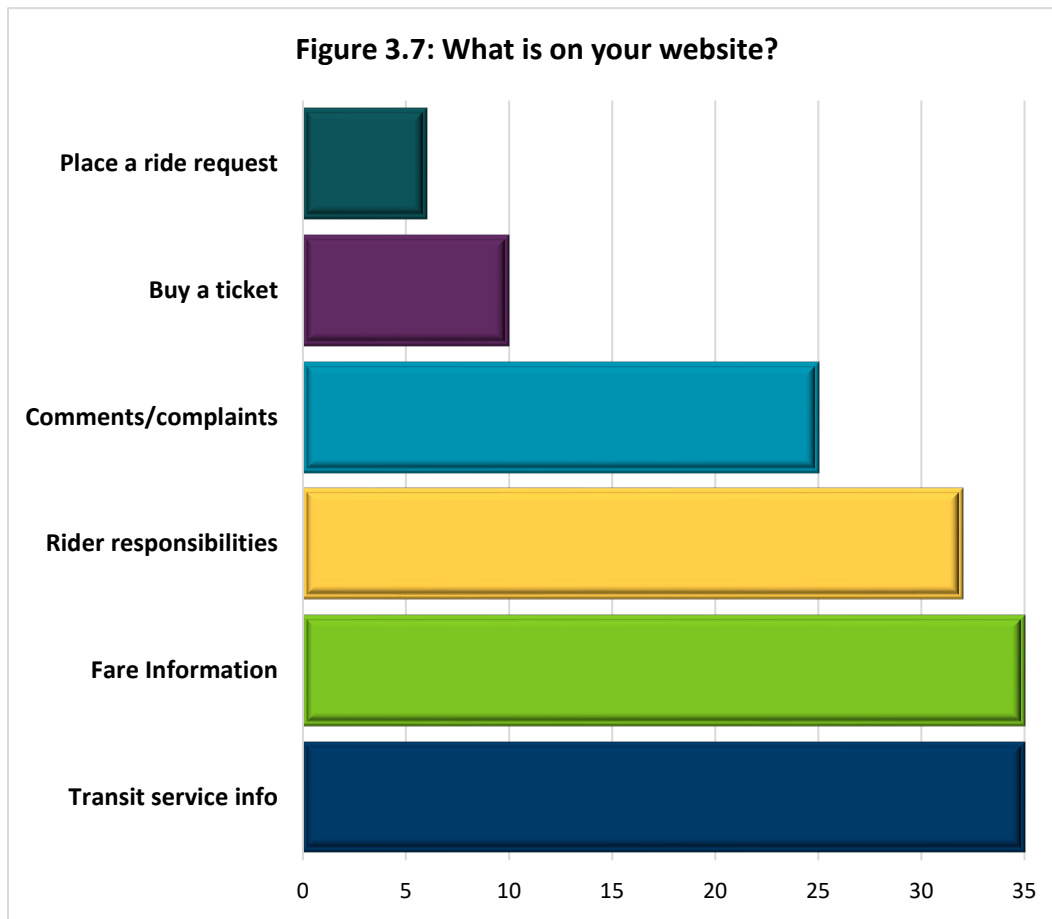
Transit agency	Technology challenges: What parts of your technology infrastructure are the most challenging for your organization?
Arrowhead Transit	Our largest challenge is full integration. The inability for all our software programs to provide direct updates to other programs. (Example: Routematch to BlackCat)
Becker County Transit	Good high speed internet for dispatching software
Brown County Human Services	Internet redundancy
Central Community Transit	Having a contracted IT support sometimes has time delays. The support line is very helpful but sometimes time consuming.
Chisago - Isanti County Heartland Express	Lack of wifi access for the public
City of Brainerd	Most concerned about emergency plans. No electricity means no operations
City of East Grand Forks/Cities Area Transit	It's difficult finding the time to train and use new technology with the limited amount of time and increasing number of tasks for my job position
City Of La Crosse MTU	Keeping up with license renewals
Community Transit of United Community Action Partnership	Internet speeds can hinder the amount of shared data between offices.
Duluth Transit Authority	Purchasing new systems like phones, secure door access, etc. High quality camera systems as well.
Fond du Lac Transit	The size of the network Some of the wireless locations Staffing

Transit agency	Technology challenges: What parts of your technology infrastructure are the most challenging for your organization?
Friendly Rider	What else is out there? Billing Electronic Fare
Hibbing Area Transit	Probably dispatch/scheduling, but I would need Shubat to clarify as they are our 3rd party operator. At the time of completing this survey, they have not gotten back to me yet, but scheduling/dispatch software has been discussed as well as GPS tracking for the buses. Having our IT provider be remote is a challenge when we have a need that needs addressing right away
Kanabec County - Timber Trails Public Transit	Current cost of software annually. We are a small agency, serving a single county. The service we provide allows for greater integration of transportation in our county - we like how we are doing it. Being small leaves us a very limited budget for expensive software.
Mankato Transit System	Lack of dispatch software
Minnesota River Valley Transit	Implementation of Route Match scheduling software
Paul Bunyan Transit	Bad cell tower connections for communicating with bus tablets and AVLs
Prairie Five CAC, Inc. (RIDES)	Phone system is 6-7 years old and will need to be updated in the near future.
Prairie Lakes Transit	Internet access is terrible not able to get cable internet but rely on DSL through a phone company that is going bankrupt partly because of their terrible customer service.
Rainbow Rider	In the past accessing and viewing camera footage from our bus' was always a challenge. We are currently in the process of upgrading that equipment so we can view it remotely. A lot of people in the agency have their complaints about RouteMatch, Their customer support team is usually very slow at providing solutions, and their user interfaces are poorly made and outdated.
Rochester Public Transit	Automated Passenger Counters have not been successful. Tablets are also not working well with increasing replacement costs. We also face internal staff shortage with the expertise to address these.
Semcac/Rolling Hills Transit	Server considerations.
SMART Transit	(Routematch) RM has its known issues.
Three Rivers Community Action/ Hiawathaland Transit	We only have one tech admin on staff and that person is shared agency wide. Our phones our internet based so if we lose the internet, we lose phones as well as access to our scheduling software.
Trailblazer Transit	Slow internet speeds, replacing aging technology
Tri-CAP Transportation	Software that operates well with our specific agency needs with both public transit and volunteer driver services.
VINE Faith in Action	Wireless is slow and sometime not available
White Earth Public Transit	Dispatch software
Winona Transit	Too much going on at once!

WEBSITES AND SOCIAL MEDIA

Websites

All 35 respondents reported having a website. Figure 3.7 displays the content reported on their websites.

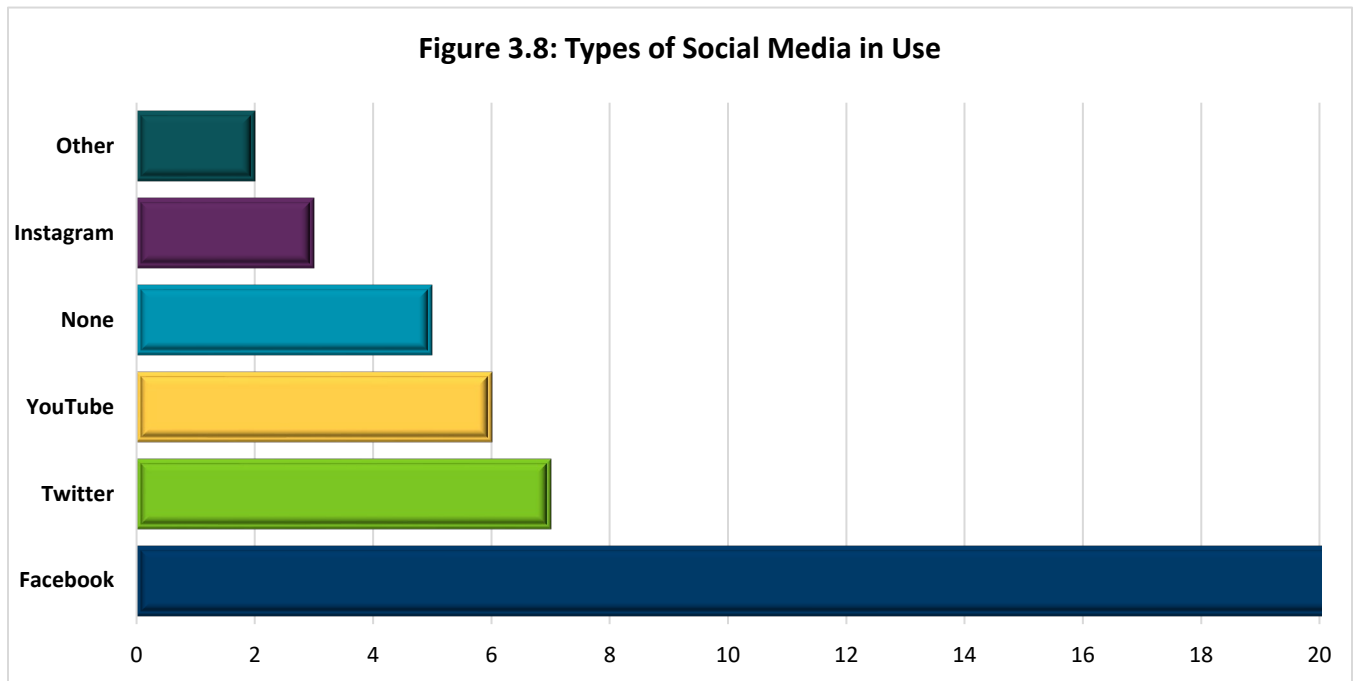


Comments:

- The website tells you where you can buy a ticket, but you cannot purchase a ticket through the website.
- Link to the city website, delays & detours, COVID updates, transit planning
- Rolling Hills Transit does not have a stand-alone website. It has a page on parent company website. www.semcac.org/Transportation/public-transit-buses
- Our information is on the Three Rivers website and they can make a comment and/or complaint on the home page, but no real complaint/comment link on the transit page.
- Transit is part of the City of Morris Website and is currently being updated.
- Maps, employment opportunities and ability to apply for a job through the website
- Trip cancellation, alerts with push notifications, links to Jefferson Lines
- Trip Planner (St Cloud Metropolitan Transit Commission)
- We have position listings and an informational form that notifies managers of potential applicants and will have an informational board to post updates on Transit service interruptions, technical difficulties, or new services or promotions.
- Social media thread for what is posted on social media.

Social Media

Which of the following social media does your transit agency use? Choose all that apply and use the space below to explain how you use social media for agency purposes. Figure 3.8 shows the responses.



Please explain how your transit organization uses social media:

- Advertising route and updates for changing info
- Promotions. Announcements. Education. Information. Q & A.
- If we change our service design, we post those changes to the site. We post our hours of operation, information on how to purchase bus passes, price to ride the bus, etc. A lot of the same info that can be found on our website. If we need to reach our riders, we can put a post on our page. We can also address complaints or comments.
- Information on route changes and fare suspensions due to Covid19
- Post informational messages and posters
- We use Twitter and Facebook to share important and time-sensitive information with our ridership. This could include short notice service changes, plans for upcoming service changes, requests for input on plans, etc. Also, from time to time, we use social media to amplify other related content from the City or other related entities. YouTube is used primarily in an instructional capacity and is used less frequently. For example, the last videos were how to use the farebox and how to use the bike rack.
- Very seldom, usually only when something is out of ordinary
- Communicate closures, achievements, and successes, notify public of changes
- We use social media to promote, update and stay in contact with our passengers.
- Cities Area Transit (our contracted service provider) has a dedicated staff member who posts transit information and advertises our service daily
- Semcac home site
- We use our Facebook page to post updates on service, a place to post job posting, meet the staff articles, and news about what's going on in transit.

- Mostly to post announcements -- weather and COVID 19 related.
- To get out important announcements and changes such as weather, updates on wearing masks on the bus and being fare free
- We have a couple videos on YouTube and we try to keep our Facebook page updated with current information.
- advertising upcoming events, use face book to provide Holidays and weather closings. Also, during COVID it was used frequently to update the public quickly.
- General announcements and urgent announcements (like service closure for weather) accompanied by radio
- Posting service changes and new information.
- Facebook for closures and updates due to current pandemic and weather
- Communicate with passengers.
- Have Facebook but not up to date.
- We use Facebook to inform the public of any events, promotions, or issues with the Transit/Agency services. We also monitor comments and posts to the page regarding complaints, kudos, and suggestions.
- Communicating changes to service, etc. to our passengers. Also announcing various updates such as holiday closings, promotional items, and other misc. things.
- Detours mostly or service-related incidents

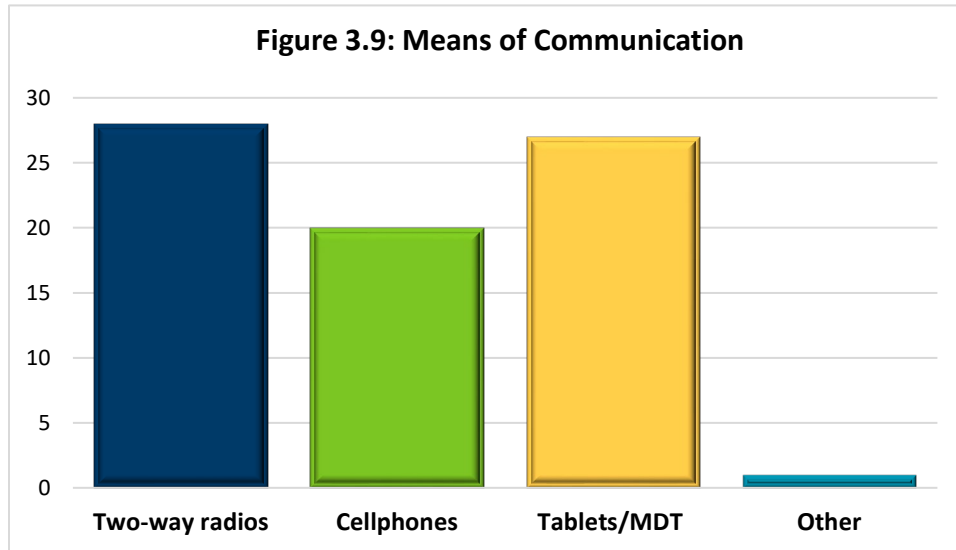
Comments: Feel free to use the space below to provide any additional information about your agency's website or social media.

- We would love if we had additional staff time to more frequently update our website and social media site and reply to potential rider comments. We have a hard time keeping up with our Facebook page due to staffing levels
- Social media is not a desirable platform for our service
- We have a communications team that is made up of individuals in all areas of Three Rivers. They work together to post updates on our social media outlets. Transit only has Facebook however Three Rivers has a twitter account.
- We are working with Melinda's group has a consultant and we are working with her to make our website more user friendly
- Just updated in 2019
- We have done some targeted posts through Facebook when they give us a credit to do them for free. Other staff manage this part so I'm not well versed in that area.
- I like our website- up in the air in regards to Facebook.
- UCAP is working on setting up a twitter site. We would like to have our runs show up on Google Maps but we need more IT assistance to do that.

COMMUNICATIONS

Dispatch

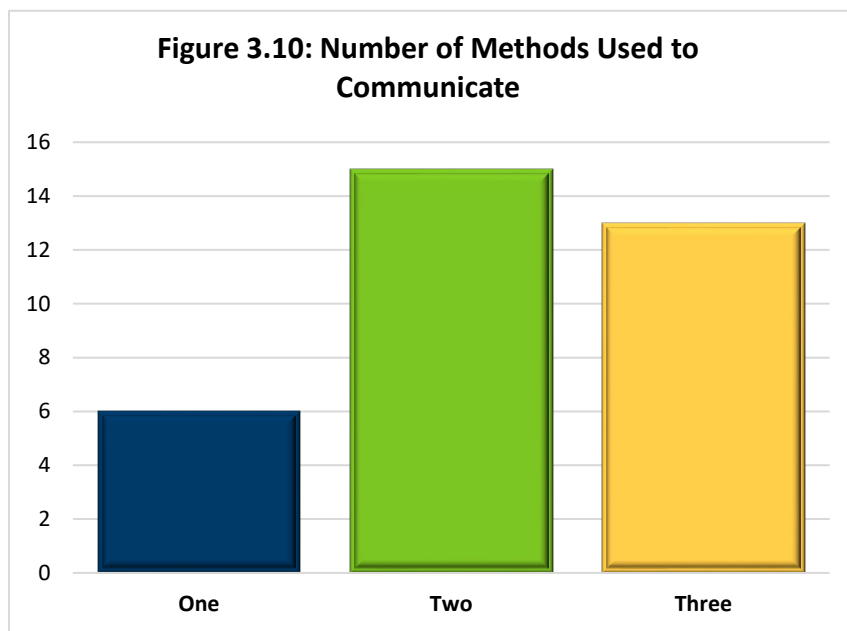
How do dispatchers and drivers communicate? (choose all that apply). Figure 3.9 shows responses.



Comments:

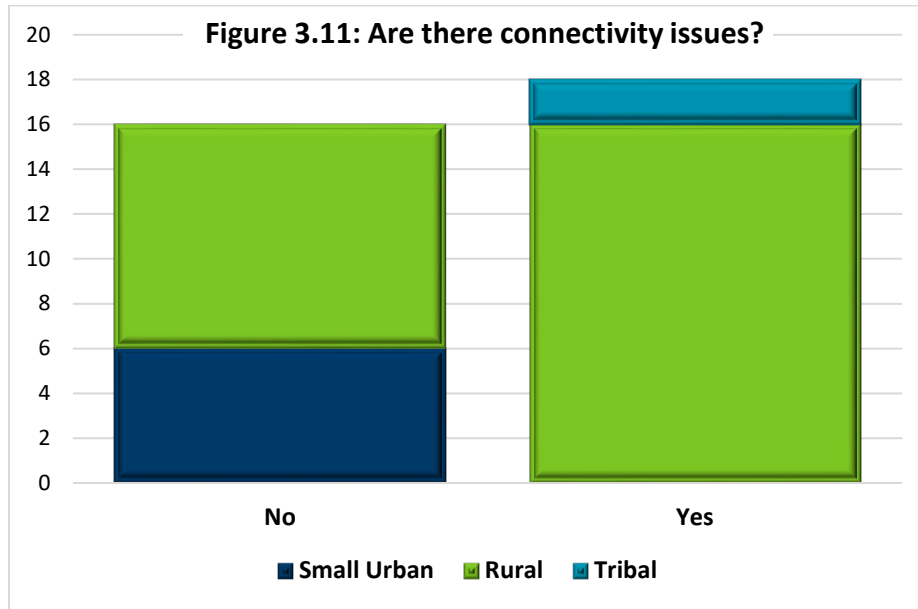
- Office walk-in
- Primary through radios with tablets being secondary

The responses show that it is most common for agencies to have redundant means of communicating, as shown in Figure 3.10.



Connectivity

When your drivers are in the field, are there communication reliability problems (cellular, internet) that affect their ability to provide service? Figure 3.11 illustrates the results with comments following the figure.



Comments from those reporting no connectivity issues:

- I don't believe so, but I would need Shubat to confirm if they are having reliability problems
- Minor issues with software upgrades
- Occasional inference from other users.
- Only issue is with the two-way radios always being able to be reached on the west end of the county.
- I think it could be simplified
- We do have some areas with limited reception but mostly good

Comments from those reporting connectivity issues:

- Topography can make a difference Lack of cell phone towers.
- Cell towers connections, tablet connections,
- Tablet Program does not work very well, it is not reliable.
- Some minor dead spots for 2-way radio, sketchy internet service in some areas
- Infrequent but when the internet goes down, drivers can't receive additions, deletions, or changes on their tablets.
- Communication is wireless service. Our service area has dead spots for wireless connection. Any message is held until travel back into wireless service area
- Our two way radios seem to cut out in certain areas more so than others. This forces us to rely on cellphone usage, which we try to discourage as much as possible.
- In some areas tablets will not communicate
- Some areas have limited coverage but we are at about 90% fully covered with Verizon
- On occasion the two way radio towers go down as they are very rural but it's usually very reliable.
- Very seldom.....internet disconnection
- If our internet at our dispatch location is weak or fails we cannot get rides through to the drivers with the tablets so we have to do radio communications

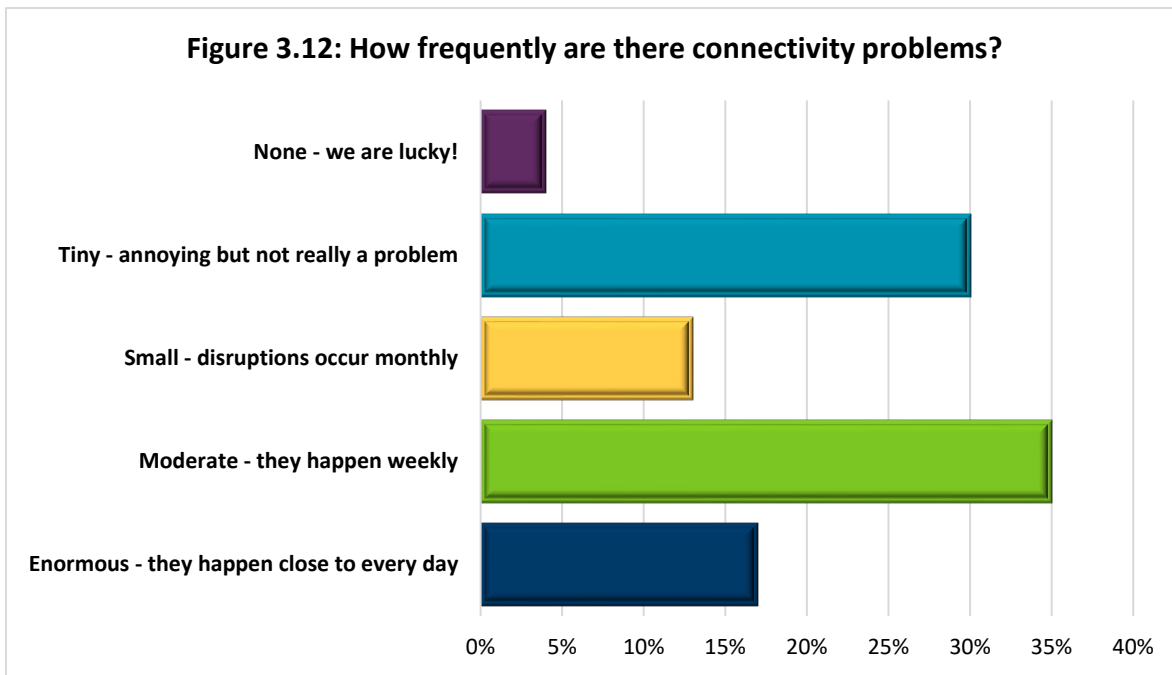
- Cell service due to rural area
- Very infrequent
- In very deep rural areas, tablet are unable to communicate with the APN when out of service range from cell towers.
- Only in Browns Valley, the reception out there is very poor. The rest of our service area has good coverage.

A few other comments were received and are listed here.

- Transit has a line within the City of Morris system.
- We have been in an office renovation project for a while and I was hoping to improve our phone system with that project. The project has been delayed often and I'm not sure of budget ability to do much for phones other than basic stuff.
- Fixed Routes and Paratransit have separate dispatch and system.
- Primarily we have reliable internet but since we cover a lot of area there is still pockets where there is no internet service.
- We used to have a backup service before we moved to the new operations building, but it was not switched over. This was recently addressed when we lost service due to road construction and they are looking into getting a backup service set up.
- Where our headquarters is located there is only one ISP, but we are lucky that they provide high-quality service and are very reliable.
- VOIP and Data connection are on dedicated fiber optic from 2 different vendors. We are able to switch to doing both VOIP and Data over one connection if one of the 2 services goes down.
- All 3 locations have separate internet providers with a backup provider.
- Currently upgrading to internet fiber, but this is very challenging
- Phone system is in need of updating
- We have full redundancy on our phone and tablet communication systems.

A follow-up poll was conducted during the N-CATT Technology Summit to ask about the frequency of disruptions. Note that the follow-up poll had different participants than the online survey.

Many of you mentioned internet/cellphone/two-way radio connectivity issues. How much of an issue are these connectivity disruptions?



The geographic areas reporting connectivity problems are shown on the map on the next page.

Other Connectivity Factors

Questions were also asked about the reliability of the internet, whether there was backup internet available, and if telephone systems had business software with features such as queuing. These questions were answered by 34 respondents.

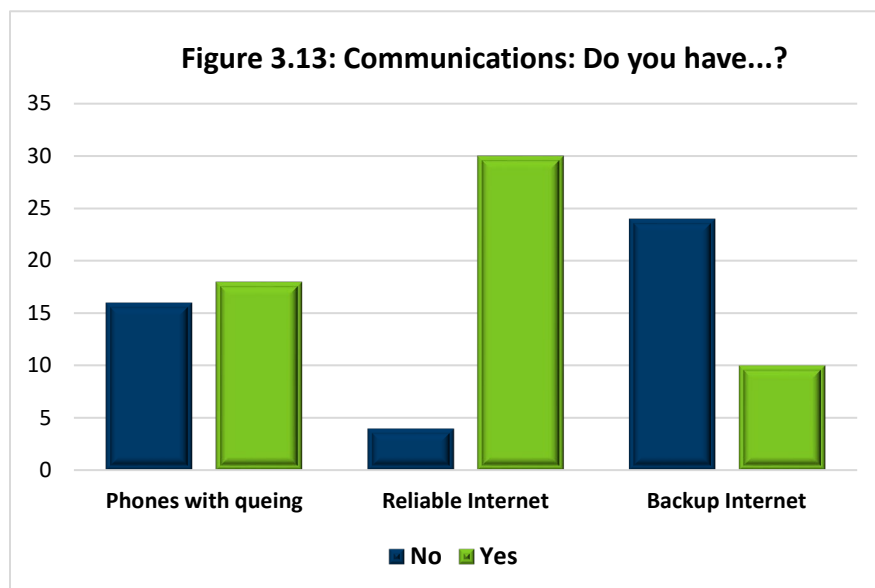
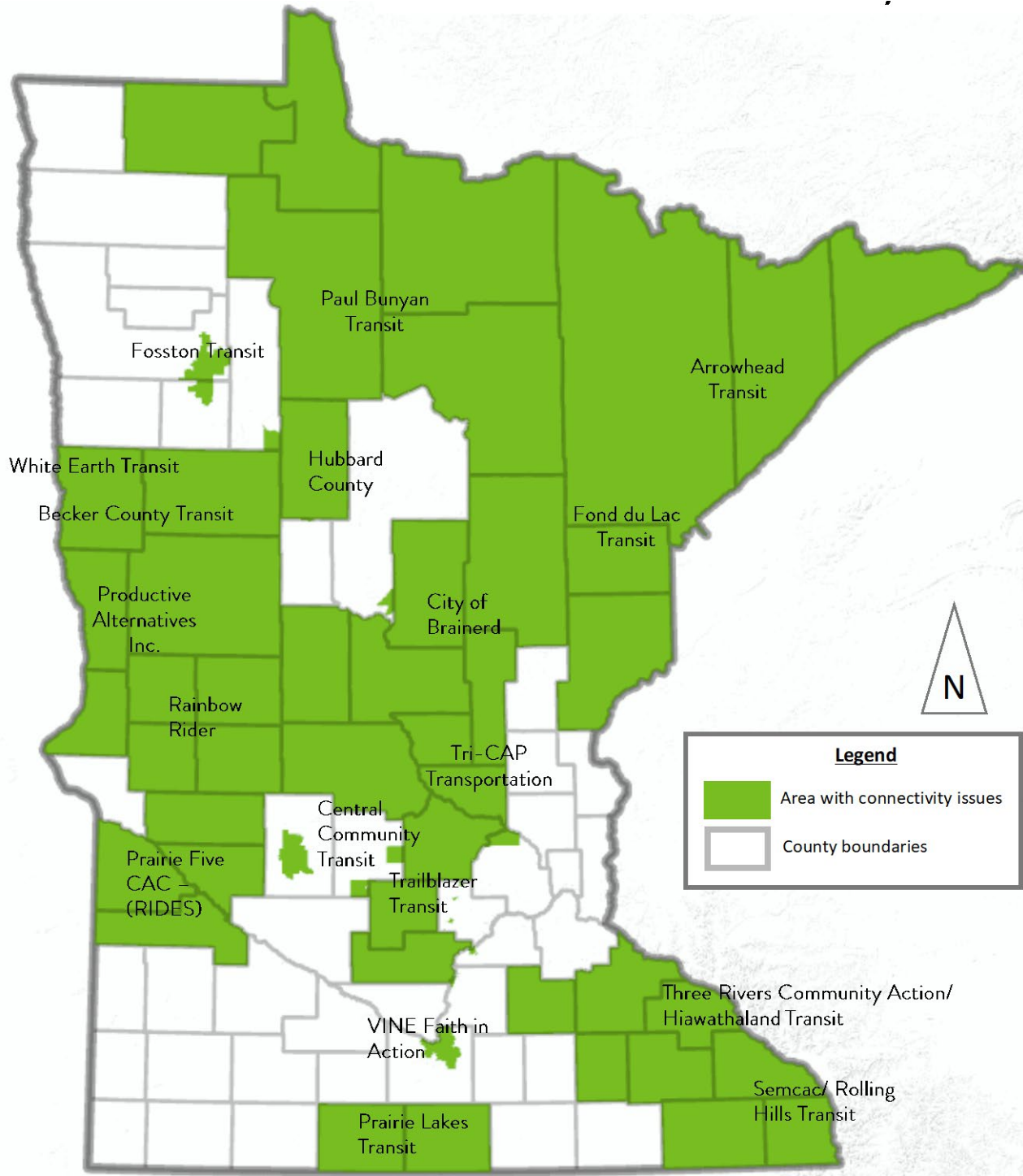


Figure 3.14: Map Showing Transit Agencies Reporting Connectivity Issues

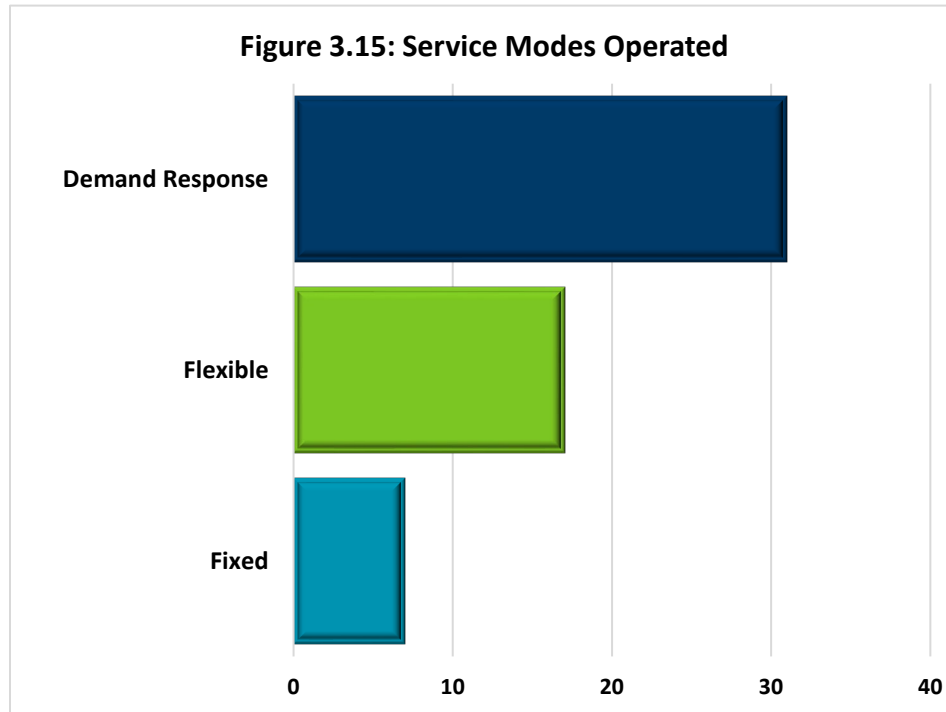


SERVICE DELIVERY

This section asked about the mode of service operated, some details on the level of service (ridership or fleet size), and how demand response and flex routes were dispatched.

Services Operated

The majority of systems operate deviated or flexible route services or demand response services.



Five of the respondents reporting fixed route services are in small urban areas while two are in rural areas. The small urban areas are Duluth, La Crosse, Mankato, Rochester, and St. Cloud. The rural areas are the Fond du Lac Reservation and Three Rivers Community Action. (The Fond du Lac website defined their service as deviated fixed route but much of the service may essentially operate without deviations.) East Grand Forks (Cities Area Transit) and Moorhead (MatBus) did not respond but also operate fixed route services and Complementary Paratransit services.

GTFS Data

GTFS data is reported as provided by Duluth, Fond du Lac, La Crosse, Rochester, and St. Cloud. Mankato and Three Rivers Community Action do not yet provide GTFS data.

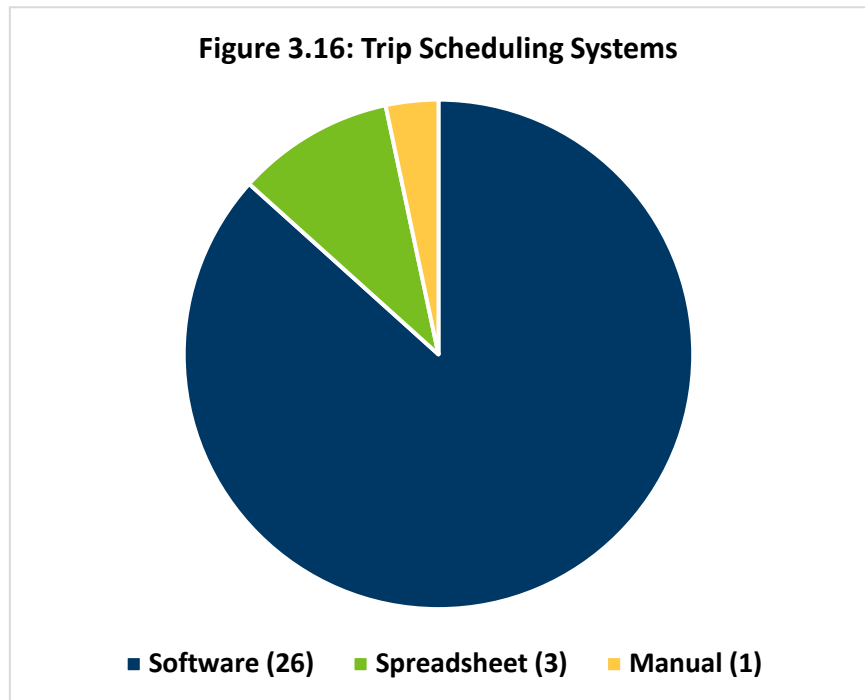
Scheduling Demand Responsive Services

For both flexible and demand response services, respondents were asked how they scheduled demand responsive trips. The options were:

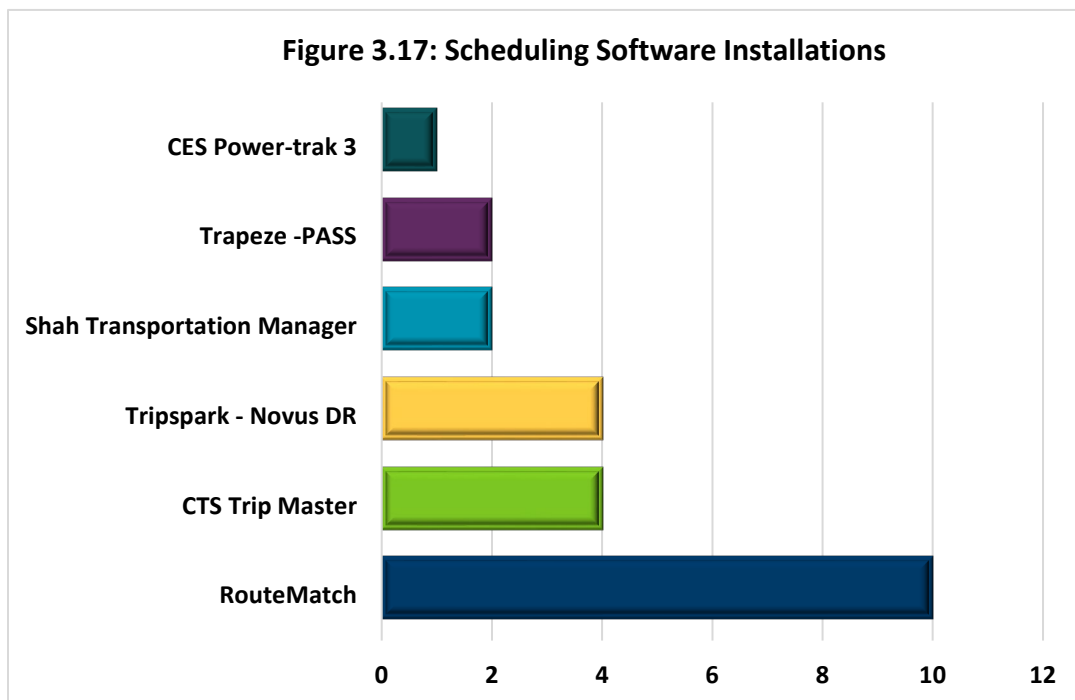
- Manual system (such as a whiteboard or index cards)
- Spreadsheet on computer
- Scheduling software (if yes, describe below)

Those agencies reporting the use of software to schedule flexible routes used the same software in their demand response services.

Thirty systems responded to this question. Several of the small urban areas did not, presumably because the person completing the survey did not know the answer. While not reflected in Figure 3.16, it is expected that City of La Crosse (operating the La Crescent Apple Express), MatBus, and Cities Area Transit use a standard software scheduling system for their ADA Complementary Paratransit services. The other two agencies that did not respond are small rural systems and could use any of the methods.



The following scheduling software packages were reported as in use by the respondents.



Comments:

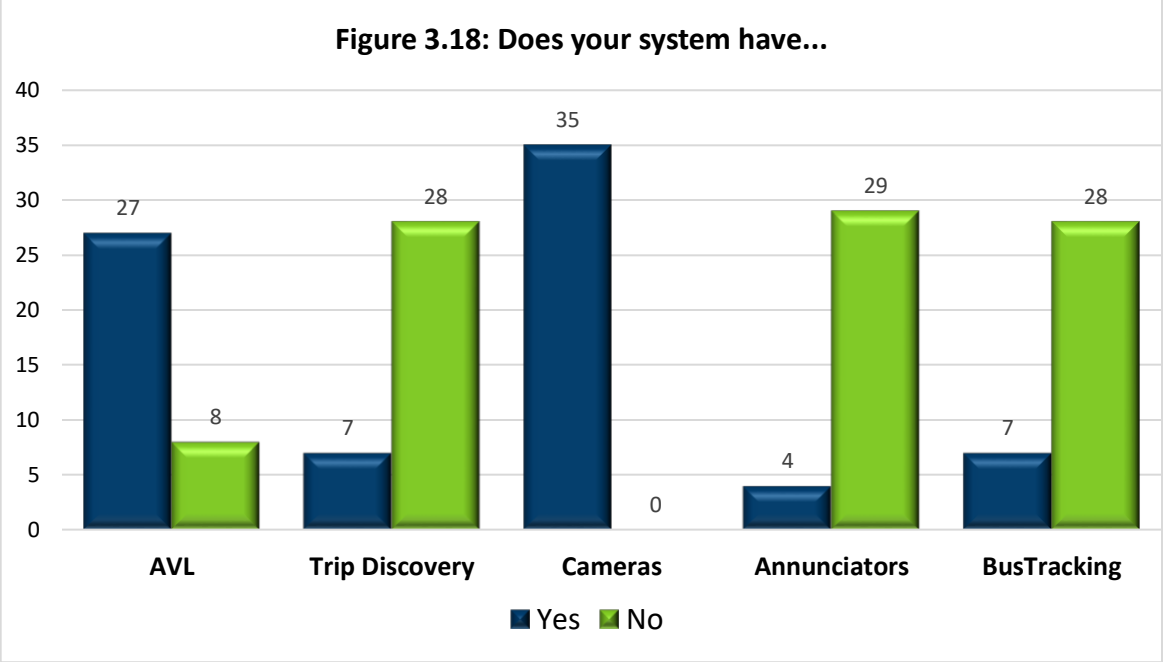
- I am not the manager or operator. So I am not sure of the vendor or software name. I am also unsure of the number of trips.

- I don't believe they have scheduling software that I know of. Our total DAR/Deviated Route trips for our system in 2019 was 54,033.
- CES power-trak 3 this program is to communicate from dispatch to tablets on the buses. Riders call dispatch/dispatch records rides on scheduling paperwork and enter the data into this program and send to the drivers.
- Dispatching software is inadequate. Working with TripSpark to improve the software.
- We are demand response. Riders call in each day at the time they need a ride.
- Ride counts are not compiled based on the type of service - demand response or deviated route.
- Our fixed route began in February and we do not have enough data to predict the number of annual riders that will see. During this pandemic we are only running demand response.
- Software has limited capabilities and will need to be updated in the near future.
- One way trip number is a rough estimate.
- The numbers were based on 2019 information.

VEHICLES AND TRIPS

Several questions were asked in this category, most with yes or no responses, so they have been combined.

- Does your agency use automatic vehicle location (AVL)?
- Does your agency have software for riders to see all possible (or coordinated) trip options to go from point A to point B? Sometimes this is called “trip discovery” or “trip information” software.
- Do you have cameras on your vehicles?
- Do your vehicles have automated stop announcements (annunciators) and/or screens with next stop information?
- Is there a way for your customers to know the location of the vehicle they are expecting?



For the last question, two affirmative options were provided: all respondents reported an app where customers can see the vehicle location. No one reported using an automated line or text their bus stop ID and receive a

response. Note that the systems with bus tracking include St. Cloud although it is only in progress and not yet operational.

Comments:

- Looking to develop an app to allow riders to see the location of the buses.
- We are hoping to add these options in the near future to allow our passengers to know where a bus is without having to call and talk with a dispatcher.
- We would love to learn more about the technology planning project. With a new director on staff, he is not in the loop of the plans put forward by MNDOT on this plan.
- Our in vehicle cameras are a joke and very unreliable. Harddrives are only pulled for serious incidents and then they work or capture the event clearly about half the time.
- Routematch has an integrated mobility app that I have tried to get funding for - no success
- Interested in participating and seeing what could help benefit out Transit be better.
- What we would like to see is greater interoperability between scheduling, payment, and reporting software. Not necessarily a single program, but programs that meet a single data
- We are in the process of adding this feature, however it is not live as of now. (St. Cloud)

Also, of the four agencies with trip planners, Duluth Transit Authority, Cities Area Transit, and La Cross MTU use Google Trip Planner. The type of trip planner used by MatBus is not identified.

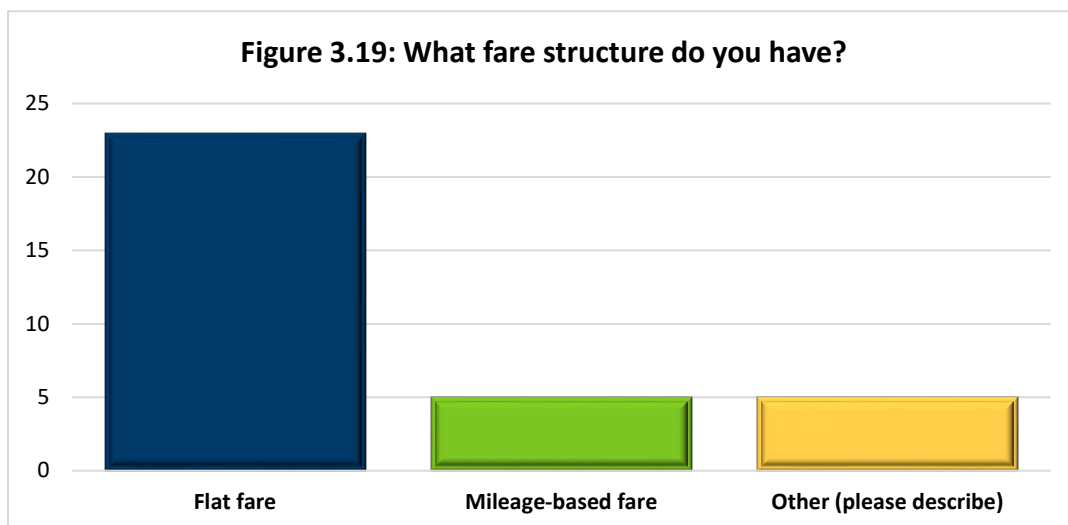
Rider apps were reported by Cities Area Transit, MatBus, and Rochester Public Transit. The City of Rochester uses DoubleMap to allow riders to track bus locations and as a management tool. The City of St. Cloud is developing a rider app.

FARES AND PAYMENT SYSTEMS

Fare collection is an important and time-consuming activity for transit systems. Good practices involving cash handling require that two people be present when counting and depositing fares. Tickets and passes must be secured and carefully tracked, both in storage and when delivered to sales outlets.

This section of the survey gathered information on the types of fares collected and solicited information on systems seeking to use technology to reduce the time spent on fare collection and make it more responsive to how people make payments today.

Fare Structures



Of the 33 respondents, 23 reported a flat fare structure, five a mileage-based fare structure, and five some other combination as listed below.

Other:

- Fare based on type of service, location, and distance on flat rates.
- Fare based on type of service and age - Route, Demand Response
- Political division
- Flat Fare, but cost is different in the 3 cities – i.e.: \$2.25 in Le Sueur, \$2.25 Senior and \$3.50 Adult in Saint Peter, \$3.50 Senior and \$5.25 Adult in Kasota
- 1.50 local in town < 5 miles, 3.00 < 8 miles, 6.00 out of town > 8 miles All one-way fares

How Fares are Accepted

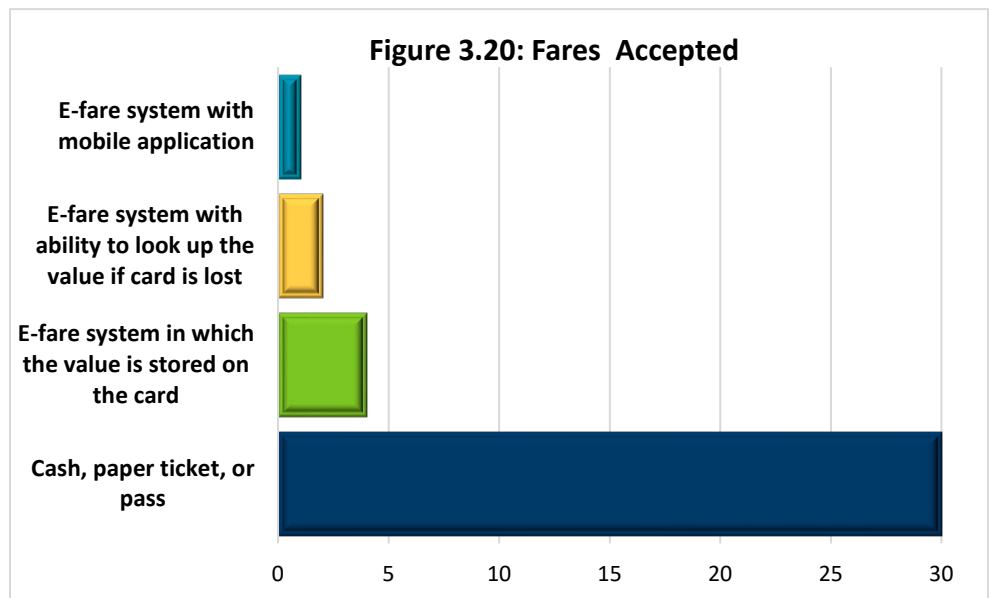
This question sought information on the systems accepting fares in the traditional way and those with some sort of electronic fare system.

Three rural and one tribal system reported some type of electronic ticketing available.

- Chisago-Isanti County Heartland Express
- Semcac/Rolling Hills Transit
- Minnesota River Valley Transit
- White Earth Public Transit.

Two urban areas reported that they are in the process of developing an electronic ticketing system. Rochester Public Transit reported they are in the process of an RFP for e-ticketing. St. Cloud Metropolitan Transit Commission reported they are in the process of adding e-fares and mobile ticketing. Neither Cities Area Transit nor MatBus responded to this question.

Two agencies reported that in their e-ticket system, the driver scans the card/mobile app with an electronic scanner. Another two agencies reported the driver visually checks the ticket/screen. One reported that the customer scans card/mobile app on a mounted scanner.



Among the other types of fares accepted, a few systems noted they accepted tokens, billed rides (in arrears), contracted rides with medical insurance providers, and vouchers. For the billing system, invoices are mailed out. One agency commented that they “Do not have credit card capabilities. Have many requests to provide online payment. Would like to have customer self-scan pay capabilities.”

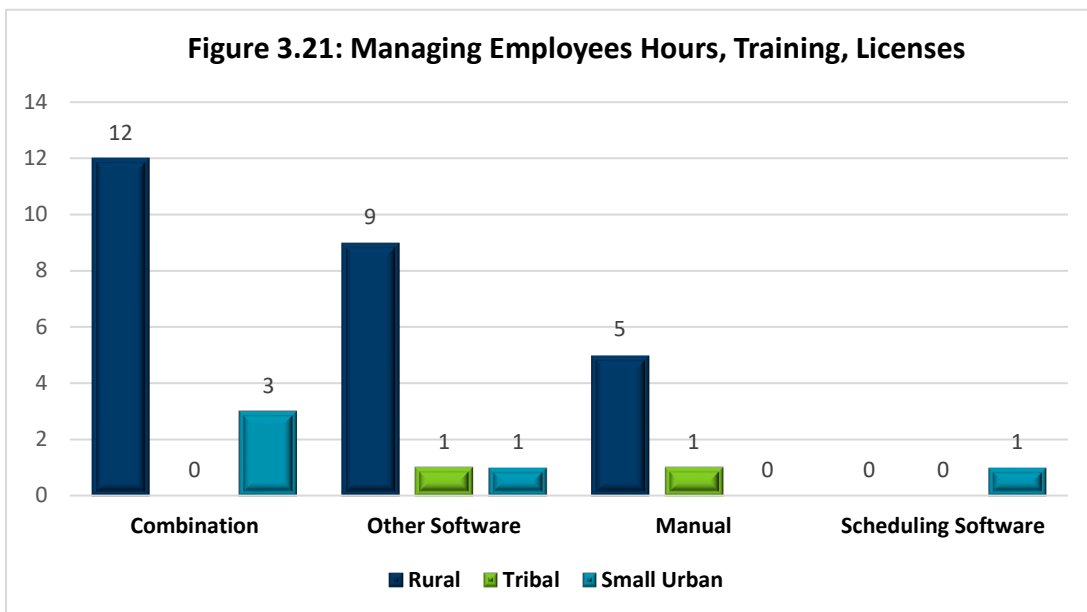
MANAGEMENT

This section covers questions about employees, maintenance, assets, and service area boundaries/coordination with other agencies. These are areas where a wide variety of management systems are employed, from paper files to software specific to a function. It is common for software to cover an entire agency function and not be specific to transit.

Employees

How do you manage employee work hours, training, license status, etc.?

- Functions are included in our scheduling software
- Functions are tracked through another software program such as an HR system
- Use a combination of spreadsheets, electronic calendars, and a manual system
- Use manual systems only



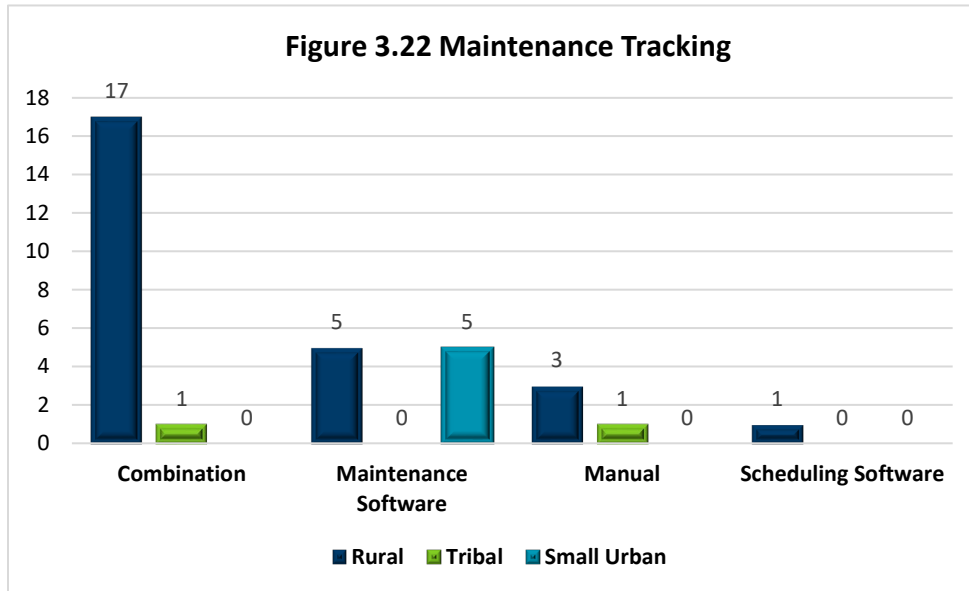
Thirty-three agencies responded to this question. Comments follow.

- This is another answer that would have to be confirmed by Shubat
- We use a web-based timesheet for all staff, and manually track license status and training's completed.
- Third Party Service Contract
- Prefer manual systems for tracking and calculating payroll hours
- Work hours tracked via HR software. Training, license status other tracking needs use excel spreadsheets
- Driver times are taken from dispatch software manifests. Training, licensing, and other compliance requirements are track through JJ Keller Encompass.
- Employees punch in on an electronic time keeping system called Time Keeper
- Snap Scheduling Software by BusinessWare
- Tsheets by Quickbooks
- Hours are in scheduling software; other info is in HR software.

Maintenance

How do you manage vehicle maintenance?

- We use stand-alone maintenance software
- Basic vehicle information is included in our scheduling program
- Use a combination of spreadsheets, electronic calendars, and a manual system
- Use manual systems only



Thirty-three agencies responded to this question.

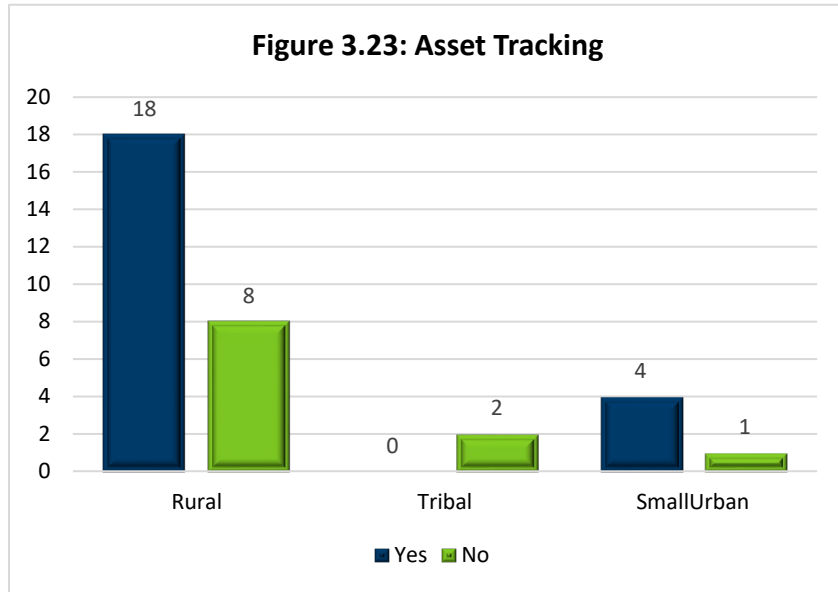
Comments:

- We use an Access database to track all maintenance completed on our fleet. This is manually entered after invoices arrive in our office.
- Third Party Service Contract
- Some basic vehicle info is tracked via scheduling system
- Collective Data Software
- ManagerPlus

Asset Management

Do you have an electronic system for tracking your assets such as vehicles, shelters, garages, etc.?

- Yes, please describe below
- No



Comments / Systems Used

- We use Tyler Technologies - Incode for asset tracking
- We have all our vehicles noted in our scheduling software, but we do monthly checks of our vehicles and garages that are done manually by staff.
- THO Software
- City accounting software BS&A
- BlackCat
- Excel spreadsheets
- ManagerPlus
- BlackCat
- We have a listing of all Federally funded assets through our Finance Dept.
- JD Edwards
- Central garage tracks all city vehicles.
- Avail Fleetnet

Service Boundaries and Coordination

Nineteen of 35 agencies responded to this question.

Transit agency	Service boundaries: If your service boundaries overlap with any other agencies (human service, Medicaid, cities or counties, etc.), please list the agency(ies) and describe how you coordinate with them.
Central Community Transit	Coordinate with transit systems all around 3 counties. Human Services coordinates with CCT
City of Brainerd	Brainerd is a transit island that does not touch my neighboring transit systems. I do work with Jefferson Lines, multiple county human services, local hospitals, HRA, healthcare/insurance, sheltered workshops
City Of La Crosse MTU	Onalaska/Holmen/West Salem Shared Ride, we offer a free transfer system between our agencies and we communicate via phone for connective service requests.
City of Morris Transit	Rainbow Rider is the Public Transit for Stevens County and Morris is located in Stevens County. Morris Transit was established before Rainbow Rider and Morris Transit provides rides for within the city limits of Morris and Rainbow Rider provides rides for those outside with the city limits of Morris.
Duluth Transit Authority	Jefferson Lines, Arrowhead Transit and Indian Trails
Fond du Lac Transit	Arrowhead Transit - Annual meetings to talk about service delivery
Kanabec County - Timber Trails Public Transit	We coordinate MA access transportation for the county
Minnesota River Valley Transit	Human Services and Public Health purchase bulk tickets and distribute them to their clients as they see fit. Human Services will purchase tickets with a check at the counter and Public Health e-mails the order, picks up tickets at the counter and is invoiced for the cost of the tickets.
Prairie Five CAC, Inc. (RIDES)	Family services for the following counties-Big Stone, Chippewa, Lac qui Parle, Swift, and Yellow Medicine. we hold 2 year contract with these family/ human service agencies to provide requested rides. We are paid on a per mile base as well as 1 way flat rates. We have the same types of contracts with BlueRide, Ucare and Medica health providers. We hold ride contracts with 3 of the DAC providers in our five counties as well, these are built in re-occurring rides almost daily. We are currently working with neighboring system to select a fare collection system, that will allow for rides to transfer and be used across systems, that will go out for bid sometime this month.
Prairie Lakes Transit	Martin County and Faribault County. Very limited trips to Albert Lea in Freeborn County.
Productive Alternatives, Inc.	Otter Tail County, Productive Alternatives, Becker County, Wadena County, Rainbow Rider. We provide many rides for Otter Tail County. Productive Alternatives is our parent company and has three different DT&H locations as well as the volunteer driver program that we provide local rides for. We contract with Wilkn County DAC for rides for their people. We also have worked with Becker and Wadena Counties to provide rides for their residents as well.
Three Rivers Community Action	Our services overlap with private companies providing transit via taxi, STS and volunteer services. We currently do not have anything in place to coordinate with

Transit agency	Service boundaries: If your service boundaries overlap with any other agencies (human service, Medicaid, cities or counties, etc.), please list the agency(ies) and describe how you coordinate with them.
	these providers. We are open to working with others to provide options for members of the communities we service to access areas we currently cannot get to.
Trailblazer Transit	Telephone or email
Tri-CAP Transportation	Ride coordination is completed formally and informally via phone calls, emails, and meetings.
VINE Faith in Action	We coordinate with Brown County by providing rides to/from New Ulm. We also coordinate with Scott County providing rides in New Prague. We also coordinate rides with Land to Air, MRVT, and Hartland Express.
White Earth Public Transit	Becker County Transit, Tri-valley, CHR program. coordinate by calling appropriate company

TECHNOLOGY SUPPORTS AND IMPROVEMENTS

These questions asked about the helpfulness of technical supports and the benefits of certain features. Respondents were asked to rank items in each list as Very, Moderately, or Not at all helpful. They were also given the option to respond Not applicable. Each response was weighted from 3 (Very) to 0 (Not at all/Not applicable) to come up with a composite score.

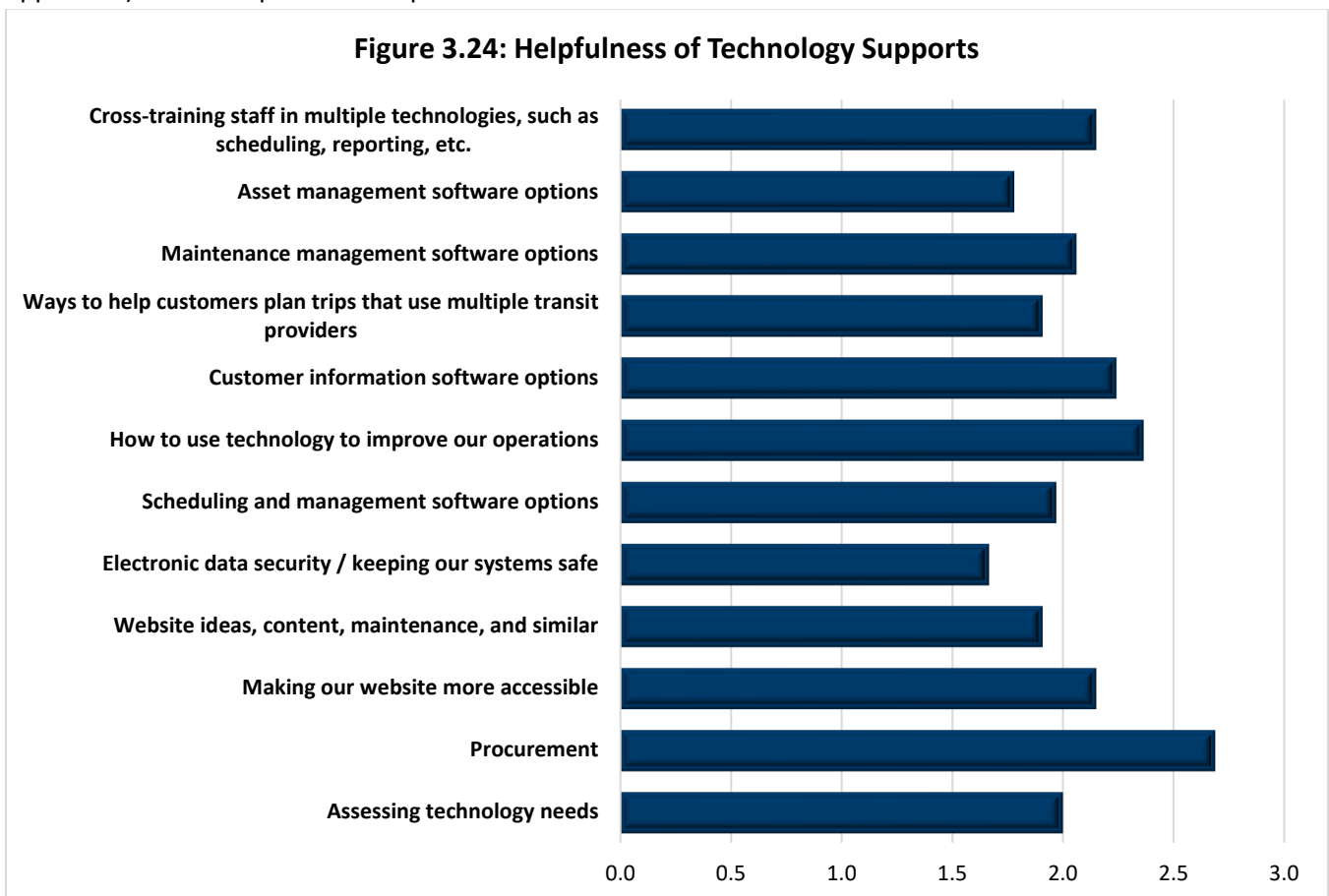
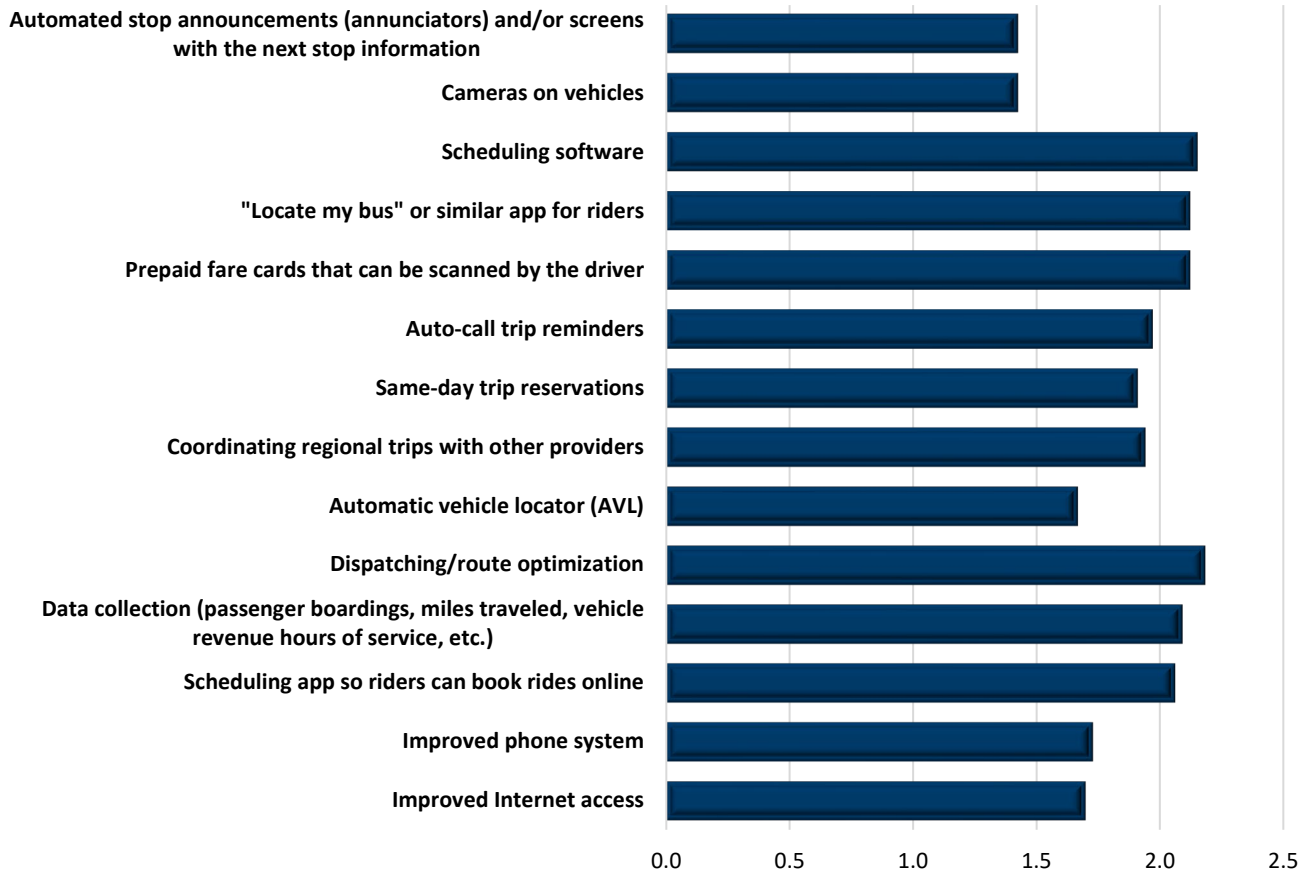


Figure 3.25: How Beneficial Would These Features Be?



SURVEY CONTENTS – MNDOT TRANSIT TECHNOLOGY PLANNING: TRANSIT AGENCY TECHNOLOGY INFORMATION

The survey sent to Greater Minnesota transit agencies is shown beginning on the next page.

MnDOT Transit Technology Planning: Transit Agency Technology Information

Introduction

As a rural, Tribal, or small urban transit provider, thank you in advance for helping develop MnDOT's Greater Minnesota Public Transit Technology Plan.

The TransitPlus consulting team is working with MnDOT on this project, which has the following components:

1. Assess and evaluate completed transit technology planning activities
2. Work with key stakeholders to define a statewide transit technology vision
3. Collaboratively identify technology goals and objectives
4. Create a reliable baseline for making technology investment decisions by researching other systems and trends
5. Produce a Greater Minnesota Public Transit Technology Plan

The information you provide in this 20-minute survey about your agency's current and planned transit technology is the basis for the first component. Learn more about this project and how you can be involved on the project [website](#).

Need help?

- You may wish to print a PDF of the survey in advance in case you need to gather additional information; click [here](#). If you have questions or need help completing any part of this survey, please contact consulting team member Erica Hamilton via [email](#) or call 1-303-807-6023.

Please take 20 minutes to complete this at your earliest convenience. The **deadline is Thursday August 20 at 3 pm**, but earlier responses allow us to share some initial results at the Summit that week. Whatever's possible would be great!

Note: A few of the questions are required (marked with an *) so we can follow up if needed or properly

analyze the results. All other questions are optional; please complete all that apply to your agency. * Name of your transit agency

* Is your agency:

- Rural Tribal Small urban

* Zip Code: Please enter the 5-digit Zip Code for your agency's main office

* Your name

* Your email address

* Your phone number



MnDOT Transit Technology Planning: Transit Agency Technology Information

Basic Information

Computer system -- Do your computers:

- Operate as a stand-alone system, not connected to a network (i.e., files are shared via email, thumb/flash drive, or similar)
- Operate as part of a local, internal network only for transit services (i.e., files are shared using a shared folder either through an onsite or cloud-based server)
- Operate as part of a larger agency computer network such as a city or county
- Other (please describe)

Servicing -- How do you service your computer systems? (Choose all that apply and explain as needed in the comment section)

- Dedicated IT staff in your agency
- Staff in agency who have IT skills *and* other responsibilities
- Contract with an outside IT organization
- Other (please describe)

Servicing -- How much capacity do the people who service your computer system have for additional work?

This could include helping implement new software, etc.

- Yes, probably
- Maybe, not sure, or need more information
- No, probably not

For ALL responses, use the space below for any questions, needs, or comments.

Security: What security measures are in place for your computer system? (Choose all that apply)

No formal system in place, although we encourage the use of good practices

Provide routine refresher training

Provide cybersecurity training for all employees

Follow HIPAA security rules

Employee Handbook includes cybersecurity requirements, guidance

Other: Please describe below

Use the space below to clarify your responses or to list any additional cybersecurity measures you have in place.

Technology successes: What aspects of your technology infrastructure are working well?

Technology challenges: What parts of your technology infrastructure are the most challenging for your organization?



MnDOT Transit Technology Planning: Transit Agency Technology Information

Website and Social Media

* Do you have a website for your transit services?

Yes No



MnDOT Transit Technology Planning: Transit Agency Technology Information

Website and Social Media

Enter your website address below.

Which of the following are included on your website? (Choose all that apply and use the space provided to add more)

Transit service information

Buy a ticket

Fare information

Place a ride request

Rider responsibilities

Make a comment or file a complaint

Other (please specify)



MnDOT Transit Technology Planning: Transit Agency Technology Information

Website and Social Media

Which of the following social media does your transit agency use? Choose all that apply *and* use the space below to explain how you use social media for agency purposes.

Twitter

Facebook

Instagram

YouTube

None

Other

Please explain how your transit organization uses social media:

Comments: Feel free to use the space below to provide any additional information about your agency's website or social media.



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Communications

Dispatch: How do dispatchers and drivers communicate? (choose all that apply)

Two-way radios

Cellphones

Tablets through a scheduling program

Other: Describe below

Connectivity: When your drivers are in the field, are there communication reliability problems (mobile, Internet) that affect their ability to provide service? Please respond and if yes, explain below.

Yes No

If yes, please explain your connectivity issues and impacts.

Phone system: Does your phone system have call center capabilities such as call queueing and call volume reporting?

Yes No

Internet: Do you have a reliable Internet connection?

Yes No

Internet: Do you have a backup Internet connection if your main one goes down?

Yes No

Comments: Feel free to use the space below to provide any additional information about your agency's communications.



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Service Delivery

* Which services does your agency offer? (required; choose all that apply)

- Fixed routes Flex-routes or deviated fixed routes
 Demand responsive

For the service types your agency offers, please answer the related questions below.

Fixed route: How many weekday peak vehicles do you operate?

Fixed route: Do you maintain GTFS files?

Yes No

Fixed route: How many one-way trips do you provide annually?

Flex-routes or deviated fixed routes: How many weekday peak vehicles does your agency operate as flexible routes?

Flex-routes or deviated fixed routes: How many one-way trips do you provide annually?

Flex-route or deviated fixed routes: How do you schedule these services?

- Manual system (such as a whiteboard or index cards)
- Spreadsheet on computer
- Scheduling software (if yes, describe below)

If you use scheduling software, list the vendor and software name below

Demand responsive: How many weekday peak vehicles do you operate?

Demand responsive: What percent of your agency's trips are subscription services -- clients booking the same trip on multiple days?

Demand responsive: How many one-way trips does your agency provide annually?

Demand responsive: How do you schedule these services?

- Manual system (such as a whiteboard or index cards)
- Spreadsheet on computer
- Scheduling software (if yes, describe below)

If you use scheduling software, list the vendor and software name below

Comments: Feel free to use the space below to provide any additional information about your agency's service delivery.



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Vehicles and Trips

Does your agency use automatic vehicle location (AVL)?

- Yes No

Does your agency have software for riders to see all possible (or coordinated) trip options to go from point A to point B? Sometimes this is called "trip discovery" or "trip information" software.

- Yes No

Do you have cameras on your vehicles?

- Yes No

Do your vehicles have automated stop announcements (annunciators) and/or screens with next stop information?

- Yes No

Is there a way for your customers to know the location of the vehicle they are expecting?

- Yes, an app where customers can see the vehicle location
- Yes, customers can call an automated line or text their bus stop ID and receive a response
- No
- Other: Please describe below

Comments: Feel free to use the space below to provide any additional information about your agency's vehicle and trip technology.



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Fares

Fare structure: What fare structure do you use?

- Flat fare
- Zonal fare
- Mileage-based fare
- Voluntary contributions
- Other (please describe)

How do you accept fares? (choose all that apply)

- Cash, paper ticket, or pass
- E-fare system with mobile application
- E-fare system in which the value is stored on the card
- Regional e-fare system in which cards/app works with multiple agencies
- E-fare system with ability to look up the value if card is lost
- Other (please describe)

If you have an e-fare system, how is it implemented?

- Driver scans the card/mobile app with an electronic scanner
- Someone other than the driver scans the card/mobile app
- Customer scans card/mobile app on a mounted scanner
- Driver visually checks the ticket/screen
- Other (please describe)

Comments: Feel free to use the space below to provide any additional information about your agency's fare system.



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Management

Drivers: How do you manage employee work hours, training, license status, etc.?

- Functions are included in our scheduling software
- Functions are tracked through another software program such as an HR system
- Use a combination of spreadsheets, electronic calendars, and a manual system
- Use manual systems only

Use the space below to provide any additional information as needed.

Maintenance: How do you manage vehicle maintenance?

- We use stand-alone maintenance software
- Basic vehicle information is included in our scheduling program
- Use a combination of spreadsheets, electronic calendars, and a manual system
- Use manual systems only

Use the space below to provide any additional information as needed.

Assets: Do you have an electronic system for tracking your assets such as vehicles, shelters, garages, etc.?

Yes; please describe below

No

If yes, describe the vendor and software below

Service boundaries: If your service boundaries overlap with any other agencies (human service, Medicaid, cities or counties, etc.), please list the agency(ies) and describe how you coordinate with them.

Comments: Feel free to use the space below to provide any additional information about your agency's other transit-management technology.



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Technical Support, Technology Improvements

How helpful would each of the following technical supports be to your organization?

Not sure / not

	Not at all	Moderately	Very	applicable
Assessing technology needs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Procurement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Making our website more accessible	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Website ideas, content, maintenance, and similar	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Electronic data security / keeping our systems safe	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Scheduling and management software options	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How to use technology to improve our operations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Customer information software options	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ways to help customers plan trips that use multiple transit providers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Maintenance management software options	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Asset management software options	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cross-training staff in multiple technologies, such as scheduling, reporting, etc.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How beneficial would each of the following technology features be for your agency?

Not sure / not

	Not at all	Moderately	Very	applicable
Improved Internet access	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Improved phone system	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Scheduling app so riders can book rides online	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Data collection (passenger boardings, miles traveled, vehicle revenue hours of service, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dispatching/route optimization	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Automatic vehicle locator (AVL)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Coordinating regional trips with other providers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Same-day trip reservations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Auto-call trip reminders	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Prepaid fare cards that can be scanned by the driver	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
"Locate my bus" or similar app for riders	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Scheduling software	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cameras on vehicles	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Automated stop announcements (annunciators) and/or screens with the next stop information	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

In-progress technology investments: If your agency has committed funds to any technology investments but haven't yet implemented them, please describe below.

Comments: Feel free to use the space below to provide any additional information about technical supports or technology investments.



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Thank you!

Thanks so much for your contributions. Learn more about this Transit Technology planning project [here](#), and contact Erica Hamilton via [email](#) or phone 1-303-807-6023 if you have any questions about this Technology Planning project or this survey.

Feel free to use the space below for any final comments.