ITS Transit Case Studies: Making a Case for Coordination of Community Transportation Services Using ITS

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ABSTRACT

Advances in computers, telecommunications, and information system technologies have led to the development of a wide range of applications that can improve the efficiency and quality of service for all forms of transportation, including public transit. At the same time, the concept of managing the mobility of a community's residents individually has emerged in many organizations across the country. Until recently, government policy, legal restrictions, and community desires discouraged if not prevented various transportation providers from working together.

In this study, the experiences of three organizations: Suburban Mobility Authority for Regional Transportation (SMART); Reach Your Destination Easily (RYDE); and ndinfo.org in planning, implementing and operating Intelligent Transportation Systems (ITS) to meet the mobility needs of its residents through improved coordination are reviewed.

Developing and maintaining an intelligent transportation system can be quite demanding. Doing so on a community rather than an agency level basis provides for a number of efficiencies both during planning and operational phases.

IMPROVING COMMUNITY TRANSPORTATION

Delivering transportation services to a community is a difficult task. In many small urban and rural communities a single individual is responsible for managing all aspects of their agency from operations, human resources, and marketing, to finance. As a result, finding the time and resources to plan for and implement changes to the organization's service policy or to study the adoption of new technologies and management techniques is usually quite difficult. The challenge is even more pronounced when the goal is for agencies to coordinate with one another to improve the efficiency of the entire community transportation system. Barriers to coordination may include concerns about regulatory requirements, perceived incompatibility of goals and needs, and uncertainty of the benefits that accrue to each agency are often noted.

Fortunately, a number of contemporaneous developments make the present an opportune time for transportation providers throughout the nation to revisit the issues of coordination, technology, and management techniques. Efforts at coordination among local transportation providers are receiving a greater emphasis

and in many parts of the country additional resources have been made available. The price of technology targeted at the issues faced by small urban and rural transportation providers continues to fall. Finally, the management techniques and processes for making the most of available resources continue to be refined and in their present form may provide valuable alternatives in addressing the mobility needs of their community's residents.

Designing and implementing an intelligent transportation system at the regional as opposed to agency level provides a number of benefits. Many of the benefits and challenges of developing a regional intelligent transportation system are the same as those faced when agencies try to coordinate their service. Identifying these benefits and how the challenges can be addressed are two of the motivations for this paper.

In this paper, the experiences of three organizations are analyzed. These organizations include the Suburban Mobility Authority for Regional Transportation (SMART), Reach Your Destination Easily (R.Y.D.E.), and NDinfo.org. The analysis focuses on each entity's planning for, implementing, and operating Intelligent Transportation Systems (ITS) to meet the mobility needs of area residents through improved coordination.

The goal of this study is to provide transferable insights regarding the design and operation of ITS. First among these is the integral role ITS can play in assisting in coordination efforts. Technical and institutional issues, requirements, benefits and costs, lessons learned and agreements among transportation providers and funding agencies will be addressed when applicable.

Coordination, Mobility Management, and ITS

For those unfamiliar with coordination, mobility management, and ITS, a brief review may be beneficial before proceeding to the case studies. Reframing the challenge of providing transportation to managing mobility often improves both the design and delivery of service. ITS provides both the tools and the framework for improving coordination among transportation providers. In addition, the development and deployment of an ITS architecture, a tool described later in the section, requires that everyone in the region impacted by the implementation and operation of an intelligent transportation system be involved to some degree during its design.

Mobility Management

Each of the three agencies that are the subject of this study have been innovators in mobility management, a management approach that is different than that currently used by most community transportation agencies. The unique aspects of mobility management are the basis for this section (FTA 2004). *TCRP Report 21* presents strategies for local agencies that supply transportation to behave as mobility managers (Murray, Koffman, Chambers, and Webb, 1997).

The mobility management approach has impacts on service design and management as well as the relationships and interactions between the many transportation providers in a particular community. Mobility management relies on coordinated service to improve customer service and increase system-wide efficiency.

Mobility management differs from traditional approaches as it focuses on individuals. Transportation solutions are tailored to meet these individual needs. As a result, few, if any, communities will be best served with a single, uniform transportation alternative. Instead, a number of diverse services will likely need to be provided.

Similarly, though the many services needed by a community's residents could be delivered by a single provider that will usually not be the case. In fact, agencies that provide transportation will serve as brokers which guide riders to the most efficient and effective service in the community that meets their needs. This will require that agencies act not only as service providers but also as mobility advocates.

The ability to succeed using the mobility management approach is enhanced with ITS. This arises due to the increased complexity introduced when managing a system focused on the individual. ITS provides the tools and procedures that allow for the collection, storage, and use of the large amounts of information needed to properly managing a community's mobility.

The degree of mobility management can vary greatly. At a minimum, mobility management involves a change in the approach of designing and delivering service at the agency level. At the other end of the spectrum, mobility management includes becoming involved in the development and management of all aspects of the transportation infrastructure in order to improve the efficiency of the system.

Coordination

Providers of community transportation are limited by financial and legal constraints. One of the greatest opportunities for improving the service delivered by any one agency is to work with others in the community. Despite the potential benefits, few efforts at coordination have been successful. However, there are signs that things may be changing.

Coordination has been defined as the sharing of transportation resources, responsibilities, and activities of various agencies with each other for the overall benefit of their community. This coordination can and has taken a number of forms based on the needs of the particular community. The primary idea is that by working together, agencies that provide transportation services in an area can increase system-wide efficiency.

The benefits associated with coordinating transportation in a community have long been acknowledged. However, related costs, financial and otherwise, have often inhibited local coordination efforts. Recent developments have, however, brought coordination to the forefront of important issues facing transportation providers.

Executive Order 13330, signed by President Bush in February 2004, established the Interagency Transportation Coordinating Council on Access and Mobility which is intended to increase coordination among 62 federal programs that provide funding for human service transportation. It complements the United We Ride program, a federal interagency program led by the Federal Transit Administration, aimed at addressing these same coordination issues. United We Ride efforts include providing a framework and technical assistance designed to aid local efforts to address coordination, state grants to fund innovative coordination programs, and awards to recognize leaders in the application of coordination principles.

There are a number of benefits to coordinating efforts among agencies that deliver transportation services in a community. These benefits include increased access to funds, a more cost-effective use of resources, improved efficiency, and centralized management of resources. Barriers to coordination include concerns about remaining in compliance with regulations, perceived incompatibility of goals and needs, and uncertainty of the benefits and costs that accrue to each agency.

ITS in Public Transportation Systems

Intelligent transportation systems (ITS) refer to the technology, data, people, and processes used to provide mobility, enhance productivity, and increase safety. In the context of public transportation, ITS is synonymous with Advanced Public Transportation Systems (APTS), though the acronym ITS is more prevalent and will be used in this study. The term ITS is also used to describe the technologies that are used to improve the delivery and quality of service of transportation. For example, computer-aided dispatch and scheduling software is often referred to as ITS, though according to another definition it would be thought of as being a part of it. In this paper, the definitions will be used interchangeable, though the precise meaning will be able to be drawn from the context.

A number of ITS technologies may help a community better meet its mobility needs. More advanced ITS technologies in small urban and rural areas include computer-aided dispatch and scheduling software, automated billing and reporting software, smartcard technology, mobile data terminal (MDT) technology, and automatic vehicle location technology. Less advanced ITS technologies include customized spreadsheets, cb radios, and internet websites.

An important, though technical, concept that aids in the understanding ITS is an ITS architecture. An ITS architecture is a framework that describes agreements among agencies, defines the functions of technologies it uses and how the technologies interact, that is it identifies the data that will be shared between ITS subsystems. R.Y.D.E., one of the agencies that is the subject of the case studies that follow, designed, implemented and maintains a regional ITS architecture.

As of April 2005, a regional architecture is required to be in place whenever funds from the federal Highway Trust Fund or Mass Transit Account are used to fund ITS projects. In the future, most transportation agencies that adopt ITS technologies will not have to go through the process of developing an ITS architecture from scratch, but will instead rely upon the work of their predecessors. However, in some cases, the existing architecture may need to be modified to accommodate the plans of transit agencies, particularly those who plan on more elaborate or cutting-edge ITS projects that were not considered when the architecture was first designed.

THE THREE SYSTEMS

SMART provides fixed-route and demand-response service to the counties of Wayne, Macomb, and Oakland in southeast Michigan. It also works with and administers programs and locally generated funds for community transportation providers which are referred to as Community Partners. SMART currently employs a broad array of technologies to help it effectively and efficiently provide transportation to the communities it serves, however, the centerpiece of SMART's current intelligent transportation system related to coordination is its real-time demand-response

system. This system allows its Community Partners, local social service agencies and other entities to schedule rides on either SMART's or its Community Partners' fleet. The system relies upon an information and computational hub, located at their Oakland Terminal, which may be accessed via the internet. As the data processing for system occurs at the hub, a low-cost computer can be used by Community Partners and others to take advantage of the same functionality available to SMART itself.

R.Y.D.E. is a transportation broker located in Kearney, Neb., a city of nearly 30,000 that provides services to a multi-county region. Though only a little over five years, old, R.Y.D.E. has seen a tremendous growth in ridership much of which would not have been possible in the absence of technology, primarily its scheduling and dispatch software. As part of its adoption of new technology, R.Y.D.E. developed its own ITS architecture a process that has provided numerous benefits to the agency and the community it serves. R.Y.D.E. has long-term plans for the implementation of additional technology including mobile data terminals

NDinfo.org is a novel statewide approach to address the challenges of mobility in North Dakota. The intent is for NDinfo.org to mature into an online hub of information on various social services, including transportation service, which is available to individuals throughout the state. One of the program's most promising features will allow for increased coordination of transportation services across North Dakota. Its transportation module currently consists of a searchable online database. It is intended to eventually provide users with the ability to schedule rides and purchase tickets for trips provided by more than one entity.

Measuring the Impacts of ITS on System Performance

The benefits from coordination to southeast Michigan resulting from the organizational structure of SMART have been estimated at approximately $2.7 million in 2002 dollars (Burckhardt). This is the difference between the funding received by local transportation providers, $7 million, and the estimated cost of SMART delivering those same rides, $9.7 million. The latter value was found by multiplying the number of trips provided by SMART's community partners by the average SMART paratransit trip cost. It should be noted that much of this savings results from SMART's organization structure and not directly from ITS, though it would be difficult for SMART to provide the high quality of service it provides its clients without the use of advanced technology.

The annual financial benefits arising from R.Y.D.E's coordination efforts in Kearney, Neb., have been estimated to be $400,358 (Burkhardt, Koffman, Murray, 2003). This value was determined by multiplying the difference between pre-coordination and post-coordination per trip costs, $5.08, times the number of trips provided, 78,220. As R.Y.D.E. was quickly approaching the point at which traditional methods of scheduling and dispatch were no longer efficient station before the introduction of ITS, most if not all of the $400,358 can be attributed to the introduction of advanced technologies and the processes used to manage them which allowed for further coordination to occur.

Given the infancy of NDinfo.org, it is difficult to quantify the impacts of the program. At the present time, NDinfo.org's transportation component provides little functionality beyond its searchable database. Its proposed content and capabilities show great promise for increased coordination among transportation providers in

North Dakota. However, a significant amount of work that will make this possible has yet to be completed. Even when it does provide the planned functionality, measuring its impacts will be a difficult task.

LESSONS LEARNED

Understanding and Educating the Community

Every community and its transportation needs are unique. The same is true for the barriers to coordination that they face. Without intimate knowledge of the institutions, individuals, and relationships that exist among them, improving a community's transportation system is difficult. Providing solutions to nonexistent or relatively unimportant issues can result in continued inefficiency and the misuse of public funds. At the same time, the solutions that ITS can bring to a local community must be accepted and used in order for them to be successful.

In this section the importance of understanding the community transportation system, identifying actual needs, promoting adoption, and educating employees and the community are illustrated with examples from the three cases cited earlier.

Understanding the Community Transportation System

Individuals who have worked to provide public transportation to a community for a number of years are a valuable and irreplaceable resource when it comes to improving its residents' mobility. Knowledge of ridership behavior, especially on demand-response-systems in small communities, can become quite intimate. An understanding of the capabilities, strengths, and shortcomings of their system is needed when transportation service managers work with others in their community to increase system efficiency with coordination.

Improved coordination may result in significant changes in service for community transportation providers. Being able to predict with some degree of certainty the response of riders and other shareholders in the community to a change in service is both difficult and important. Though complex quantitative models could be constructed to estimate community reactions, in most small urban and rural areas the costs and the inaccuracy of such estimates would diminish their pragmatic value.

In order for coordination to be successful, especially those parts that rely on ITS, it is necessary to formally frame the challenges that stand in the way of improved mobility, the relationships between individuals and organizations, and the processes that exist. Efforts to do so should occur early on in the ITS/coordination planning process. The absence of such efforts may result in overlooked challenges not being addressed and potential resources not being put to their best use.

Describing these aspects of a community transportation system allows consideration of big picture concepts that are often ignored due to the demands of managing and operating the existing system. Doing so rigorously provides outside parties, including those with more technical backgrounds, with the ability to quickly understand the challenges the community faces, what resources it has to draw from, and which solutions might work best.

R.Y.D.E. and its Introduction to Systems Engineering

Early in the ITS planning process, R.Y.D.E. Transportation Director Jeff Rumery participated in an introductory systems engineering course. The course was designed to be accessible to a broad audience of transportation professionals, not just engineers and other technicians. The course proved to be an invaluable asset by helping Mr. Rumery better understand the broader transportation system of which his agency is a part.

The framework provided by systems engineering courses are designed to induce transportation providers to think about the entire community transportation system and the relationships between the many parts and people of which it is composed. It is not necessary to have a technical background or to master jargon from the field to take full advantage of such training. In fact, individuals coming from a non-technical background may be more likely than others to experience a paradigm shift as a result of the course. This may further stimulate the creativity that is necessary for coordination to be innovative and successful.

Identifying Actual Needs

A thorough understanding of the actual needs of the local community is necessary early in the planning stages for ITS and coordination. These efforts and the resulting changes in service are likely to be less successful when individual or organizational needs assessments are incomplete or incorrect.

Coordination efforts require the involvement of all stakeholders in the region. The absence of participation by any organization or individual with an interest in community transportation is likely to lessen its practical value. With the focus on ITS, the need for coordination with external agencies moves beyond those groups and individuals directly involved with transportation. For example, local police and fire departments, and other emergency management agencies may also play a role in ITS development. An exhaustive list of the organizations with a stake in ITS deployment in community transportation systems could include dozens of agencies for even the smallest of communities.

Identifying the Needs of North Dakotans

During the early stages of the development of NDinfo.org, public forums were held in Fargo, Grand Forks, Bismarck and Minot. At each of the meetings it became immediately evident that many attendees had little knowledge of the transportation options available in their local community.

Despite their lack of knowledge of existing service, attendees expressed strong interest in a number of functions they felt their transportation system should provide. Among these functions was a single source of information, including fixed-route schedules and other transportation alternatives. It was also acknowledged that an understanding of the service design of transportation for group homes in each local community was necessary to ensure program success.

For such a novel project as NDinfo.org, public participation was necessary to identify the concerns and needs of the people of the state. The absence of such activity would have likely hindered the success of the project as it seems unlikely that a

board could have recognized and properly emphasized those issues raised during the public forums.

Promoting Adoption

In many cases, ITS solutions designed and implemented at the regional or state level may be available to community agencies at a lower cost than if they had been developed and deployed locally. In spite of this, many of the agencies that would benefit from technology adoption remain hesitant. For regional or state entities to spend the large sums of money that is needed to design and implement high tech intelligent transportation systems only to see them go unused is unfortunate.

The aversion to or absence of technology adoption may be due to one of a number of reasons. In many cases, the benefits resulting from adoption are unknown or are expected to outweigh the perceived costs. In others, a fear of technology or change may also result in agencies forgoing adoption.

For those organizations that expect long-term benefits to outweigh the costs, high upfront costs may still prevent adoption. This can also be true where regional or statewide ITS solutions are available. The resources required for educating the operators of ITS are not negligible, especially in smaller systems where resources to provide for such activities are usually scarce. This is often matched with the costs of the technology that must be implemented at the local level in order to make use of the regional or statewide capabilities.

The uneven adoption among agencies or their clientele may damage the region-wide value of ITS. This is especially true if one of the primary goals for its adoption is coordination because gaps in intended service may arise and many of the planned efficiencies evaporate. This may also have the effect of eroding community support for the changes. Given the need for local funding to cover some portion of the operating expense of most community transportation system, uneven adoption could have devastating consequences.

Unaccepted ITS Solutions

Despite the development of a system that would readily and relatively easily meet the technology needs of SMART's partners at a low cost, there has been resistance by many agencies to adopt the technology. Causes include a misunderstanding or fear of technology, inability to afford initial training, software and hardware fees, and complacency. Of course, some of these agencies may already be making use of the optimal level of technology and would not benefit from further adoption.

This situation is not particularly unique. What is different is that SMART has developed a high quality system that can be operated at minimal cost, both financially and in terms of required expertise. Unfortunately, it has been adopted by relatively few of the community transportation providers that it was intended to serve.

Educating Employees and the Community

Much of the decision making involved with ITS planning and implementation occurs at an executive level. However, in order to be successful, employees and the community must learn to appreciate and use the system. Acceptance, both internal

and external, is often limited due to an absence of knowledge of the expected positive impacts.

Following the implementation of ITS, employees will often need to be retrained and may see a significant change in job descriptions. It is important that employees understand the benefits that result from ITS and improved coordination, especially when the only immediately noticeable result is an increase in work load. In some coordinated systems, these concerns may be magnified by an appearance that the burdens and benefits associated with the new system are not evenly shared among agencies or clients.

Members of the community, both riders and non-riders alike, may have similar difficulty in not being able to see the benefits that result from technology adoption. Efforts are needed to educate the public on the changes in service, operation, and the expected positive impacts. This should begin before the actual implementation of ITS to provide time for the community to adjust to the thought of the changes being made.

Understanding the Impacts of Change in Kearney

After the adoption of computer-aided scheduling and dispatch software by R.Y.D.E., a dispute between drivers and dispatchers arose due to dramatic changes that occurred due to the new technology. Drivers were resilient to following the schedule produced by the software and often improvised their own schedules, based on their passed experience before the technology was adopted. To address the situation, drivers were informally educated on the technology used by dispatchers and how it helped R.Y.D.E. provide a higher level of service to its riders.

Identifying, Tailoring, and Adopting the Proper Technology

The number of ITS technologies available to community transportation systems is large and growing. The number of combinations that these technologies can take is extensive. Effectively planning for the implementation of such technology to best serve the needs of a particular community can be quite demanding and often requires the expertise of outside individuals. At the same time, the task of developing and implementing ITS should not be simply delegated to consultants.

In this section, the value of ITS architecture, staying focused on outcomes, and the user friendliness of systems are presented. Centralization, scalability, and the concept of redundancy and backup are also covered.

Importance of Developing and Adhering to an ITS Architecture

As of April 2005, a regional ITS architecture is required to be in place wherever Highway Trust Fund or Mass Transit Account dollars are used to fund ITS projects. Though ITS architecture is mandated, an understanding and appreciation of it should be acquired by those implementing ITS. This is especially true in smaller systems where the upfront cost of complying with the existing or designing and deploying new ITS architecture, including the development of an understanding of its underlying concepts, is high.

Improved coordination of transportation services is a strong selling point for ITS architecture. Though many of the technical aspects may be better left to

consultants, there is much to be gained from understanding the process and its merits. The basis for the development of ITS architecture is that it allows transportation systems to communicate and coordinate with one another while remaining flexible enough to be ready to adapt to changes in technology.

In locations where a regional ITS architecture for advanced public transportation systems have not yet been designed, the development process provides an opportunity for involved parties, including those not directly involved in human service transportation, to come to the table to present their wants and needs and to list their assets and liabilities. The process followed is quite similar to those typically used to improve coordination in general and may result in better coordination among transportation providers, even if it was not the primary reason for ITS implementation.

R.Y.D.E. Builds its Foundation

The merits of developing, implementing, and maintaining ITS Architecture were reinforced by the experiences and sentiments of those at R.Y.D.E.. It is viewed by the agency as both the “First and Best” thing to do when planning for ITS projects. Instead of being valued on its technical merits, the sentiment at R.Y.D.E. is that the architecture design process served as a good instrument to initiate communication among organizations concerning what assets are available, what relationships exist, and what outcomes are desired. R.Y.D.E. revisits its architecture every few months as it evaluates what has, can, and will be done with ITS to better serve Kearney’s mobility needs.

In light of its merits, R.Y.D.E. felt that the initial presentation of ITS architecture usually makes it difficult for many to grasp initially. This is especially true as few managers of small transit systems are educated or have experience as engineers or technocrats. It is perceived as being too technical too fast.

Staying Focused on Outcomes

The application of ITS technologies to the challenges faced by public transportation providers can be quite exciting. However, implementers of ITS should focus on the effects ITS has on system-wide performance, including customer service. They should avoid becoming enamored with the process or the technology and should instead think about the positive impacts they will make. Unfortunately, a culture of implementing ITS just to implement ITS, regardless of its impact on riders and other members of the community, does occasionally arise.

Coordination may help reduce the likelihood of such a culture from evolving. As more parties are involved in the planning process, pressure increases to use the funds to meet the needs of the entire community. The adoption of high-cost, cutting-edge technologies that do not provide a cost effective method of improving coordination are less likely to be adopted when there are more needs to be addressed. There is also a greater likelihood that someone will object to the inefficient use of ITS or coordination funds.

R.Y.D.E. and its Focus on Performance

R.Y.D.E. felt that it was paramount to stay focused on outcomes when designing and implementing its intelligent transportation system in Kearney. Despite having

significant ITS funds at its disposal, R.Y.D.E. remained focused on the positive impacts that would result. The intelligent transportation system in place at R.Y.D.E. appears to be on track to achieving its goal of better serving the transportation needs of its community without having adopted unsuitable technologies.

User Friendliness

User friendliness is closely related to the just-discussed concept of staying focused on event outcomes. Any change in transportation service design needs to keep its focus on riders as well as other members of the community. Maintaining or increasing the user friendliness of a system will encourage continued or increased use of the service.

In the context of ITS, users can take a number of forms as nearly all individuals and organizations that interact with public transportation may be affected. These parties can be classified into two groups: external and internal. External users of ITS could include riders, trip planners, funding agencies, those with oversight authority, fire, police, and emergency response, to name just a few.

Internally, schedulers and dispatchers may see their job processes change significantly. In smaller systems this may include the move from paper to electronic management systems. Drivers may need to learn to continue to deliver safe, timely transportation while making use of new technologies like mobile data terminals.

Many ITS technologies demand little from the individuals who use them. Managers planning on using ITS to improve coordination should keep the abilities of their employees in mind. In some cases, technologically adverse employees may not desire to maintain employment following ITS introduction, often due to initially negative experiences with the technology. This issue and its impacts on the system need to be considered during the initial planning stages.

Retraining employees, be they schedulers, dispatchers, drivers, or others is usually necessary following the implementation of ITS. However, during the planning process, the impacts and demands placed on these individuals should be considered. The higher the degree of user friendliness, the easier the initial training and subsequent operation of the system will be.

The User Friendliness of NDinfo.org

The importance of user friendliness is critical to the success of NDinfo.org. As a web-deployed service it is expected that the site is easy to use with no special skills required. Of course, individuals who are unable to use NDinfo.org themselves should still benefit from the system by being assisted by an individual who can navigate the site.

Centralization

Many ITS technologies provide the opportunity for improved efficiency via centralization. The ability of many organizations to use a single shared resource and avoid the costs of duplication can provide immediate benefits.

Centralization embodies one of the major benefits of ITS with regards to coordination. A single expert can develop an expertise in managing the more

technologically advanced components of the coordinating agencies. Similarly, a single server can manage the operational data or radio tower can handle signals used by more than one agency.

SMART's Tech Hub

SMART's Oakland Terminal serves as a telecommunications and computational hub for the entire system, including its community partners. SMART also provides technical assistance to its partners including record generation, maintenance support, service analysis, and training resources. This allows SMART's community partners to focus on the demanding task of managing their respective organizations, thereby improving the efficiency of the regional transportation system as a whole.

Scalable Technology

In addition to centralization, certain ITS technologies readily allow scalability. Scalability exists when the incremental cost of increasing the capacity of system is small. It allows for the ability to increase capacity or functionality without replacing the system. The low marginal cost of additional computational storage is one example. Often technology provides excess capacity that will be utilized some time in the future.

Room for SMART Growth

SMART's system, including its telephone, bandwidth, and computational capabilities, is capable of serving the needs of a clientele many times larger than its present level. If needed, it is also readily scalable to further expand at a minimal cost. A significant increase in ridership on SMART or community partner vehicles that use the system can be easily accommodated. Adoption of the technology solutions hosted by SMART by additional transportation agencies in southeast Michigan could also be handled by the system in its current form.

Redundancy & Backup

Coordination relies on an increased sense of trust among organizations as the actions taken by one may have an increased impact on those with which it coordinates. Likewise, instead of having only a local impact as might have been the case before, uncontrollable events may have system-wide ramifications following an increase in coordination of transportation services. Related concerns about dependence upon the technology used to provide transportation alternatives are an additional concern that gain greater importance in coordinated systems.

The failure of an intelligent transportation system due to an event such as a power failure or a computer glitch could have serious impacts on its users' wellbeing. Additionally, coordination may add and ITS allow an increased level of complexity to a transportation system, making it much more difficult to operate when certain unforeseen events occur.

The answer to concerns regarding uncertainty is to introduce redundancy and backup into the system. This may involve duplication or alternative methods of achieving a function. For example, the loss of power can be mitigated with an on-site generator, electronic files can be stored in more than one location, and communications

between drivers made possible through radio or cellular phone. Though the cost of redundancy may not be small, increasing the reliability of service may be worthwhile.

Backup in Southeast Michigan

With the centralization of technology in a single location and the large area and population relying on its service, the effects of system failure could have devastating effects on both SMART and its customers. To address this, SMART has many built-in redundancies with regards to its computer, power, and telecommunications systems that ensure the reliability of the system for all but the rarest of events.

Making the most of available resources

The resources available to transportation agencies are always limited. The same is true for the monies available to implement and operate intelligent transportation systems. Making the most of available resources through diligent planning and management is of paramount importance.

Just as transportation needs vary by community so do the resources available to improve the efficiency of its transportation system through ITS and coordination. High costs are often placed on innovators; a technologically adept manager at a single agency may provide significant assistance during the implementation of ITS, and in many cases outside help may be necessary. By adopting generic technology, considering long-term costs, and ensuring that the new system can be managed once it is in place the probability of success increases. These issues are discussed in this section.

The High Cost of being the First Mover

The cost of being an innovator is high in any field and the same is true for those who are pioneers in designing, implementing, and managing intelligent transportation systems. Cutting-edge technology is usually more expensive and provides less functionality than its successors. Processes and techniques for making the most out of the available resources often begin as theories and may take years to refine. In the case of community transportation, the parties who gain most are those who adopt later generations of technology and use tested management methods.

Though ITS is far from being universally present in transportation systems and the evolution and improvement of technologies that aid in its operation continues, much of the costly innovation has already occurred. For many small urban and rural transportation providers, the relative complexity of the transportation system and its challenges may be addressed sufficiently with tested and refined technology at a low cost. By following tested processes paired with the assistance of external parties that have experience ITS implementation, the cost of developing a successful system falls while the probability of it having its desired effect increases.

SMART Innovation

Being one of the first movers in the field, not only in regard to adopting technology, but also in developing internal processes to manage the system, SMART was required to dedicate a great deal of resources to reach the point where it is today. Many of the technologies employed were much more expensive than present-day successors.

There were also missteps along the way, especially because SMART was an innovator in the pre-ITS architecture period. However, it appears that SMART has not only benefited, but flourished, because of the challenges it faced. A secondary benefit to the innovation that occurred at SMART is that it is now home to many tech-savvy individuals and an organizational culture that embraces technology and the solutions it offers to public transportation.

Attracting technologically adept managers

Managers of agencies that provide community transportation come from a variety of backgrounds; few, however, are college-educated engineers. The absence of this formal education or equivalent technical experience does not preclude an individual from being able to manage the planning, implementation, or operation of intelligent transportation systems. At the same time, a basic understanding of certain technological fundamentals, curiosity, and the ambition to improve upon the status quo are helpful.

Often, all that is needed is a single individual with these traits among the many people that are involved in coordinating a community's transportation. These qualities combined with the ability to communicate with other transportation managers about ITS increases the likelihood of success.

Managing ITS in Kearney

R.Y.D.E. was fortunate to have a manager who was willing to dedicate the time and resources necessary to develop an understanding of the technologies and processes they were considering. Having such a resource in Kearney has been an asset during both the development and operation of its intelligent transportation system.

Making use of consultants

Few, if any, transit agencies serving small urban or rural communities possess the expertise necessary to independently handle the design and implementation of ITS. On the other hand, having adequate knowledge available to oversee the work that is being done by consultants is needed to ensure the proper stewardship of public funds. Identifying what can and cannot be done in-house should be done early in the planning stages. This issue is also present following implementation because it is difficult to manage a system that its manager does not understand.

Consultants should be able to explain, and transportation managers understand, what is going on. Though some of the individuals involved in coordination efforts may have a deeper understanding of what is occurring, managers who are having difficulty should not defer technological issues to others but should request that a clearer explanation be given.

Using Low Cost Resources First

While few, if any, transit agencies have the technological background necessary to independently manage the implementation of ITS, it was the sentiment of R.Y.D.E. that in many cases consultants are not used correctly. It was their view that agencies should begin by using state and federal resources and previous innovators' expertise to educate themselves. Consultants should be contacted only after the

agency has identified what it can and cannot do on its own. This approach led to the more effective use of resources while also developing in-house expertise that could be utilized by the agency and by other entities.

Staying Generic

There are a great number of alternatives to choose from when deciding upon what ITS technologies best meet the needs of a community. There is also usually a strong correlation between the cost and functionality of a product. Low cost products may, however, provide all the functionality that a small community needs to meet it transportation needs.

Being able to identify off of the shelf and other low cost technology alternatives may not be easy. In some cases, adopting these technologies requires onsite customization that may offset the initial savings. This is especially true in smaller communities where the skills needed to provide such customization may not be readily available.

SMART does it Off the shelf and In-house

With the exception of the software used to manage the demand-response fleet, the software used to manage SMART's system is available off of the shelf. Though a degree of technical expertise, which SMART has located in-house, was necessary to connect the components in the desired fashion, a large of amount of money was saved by avoiding the use of specialized software.

Accounting for long term viability

The design and implementation of ITS in public transportation usually requires significant upfront costs to cover items such new capital, training, and initial data entry. Fortunately, external funds are often available to cover such costs while regular operating costs typically rely more on local support.

Being able to cover the operating expenses of ITS in a coordinated system is paramount to its long term viability. As these costs may be shared among users in coordinated systems, identifying where and how funds will be generated and how much burden each organization will bare should occur during the planning stages. Lowered costs or increased fare revenue may provide the needed source of local funds.

The Development of NDinfo.org

The initial grant that funded NDinfo.org came from the US Department of Transportation and the Federal Transit Administration. While the USDOT does not object to funding development projects, it is not interested in providing long-term funding to sustain them. During a quarterly meeting with the USDOT and the Community Access Program, the NDinfo.org system was identified as self-sustaining because the project involved multiple services that can assist many different service delivery agencies and businesses. This was thought to provide for collaborative efforts and a greater opportunity to bring in more partners to help support and sustain the long-term needs of the project.

Managing ITS Independently

Though few community transportation systems regularly employ individuals who can develop and deploy ITS technologies without outside help, the ability to manage a system with minimal external assistance is usually necessary to ensure that the costs of its operation remain in check. One benefit of the use of ITS by a number of agencies is that in many cases, there may only be need for a single expert to manage these components. In many cases, transportation providers may want continuing technical or maintenance support for the technology they adopt, which may be provided for in the original contract or via an additional service contract.

Maintaining NDinfo.org

It was important to have internal management tools built into the NDinfo.org system. The ability to make changes to the database and other modifications to the website without the need for programmers or website developers was a functionality desired by the project directors. For example, within the transportation module, transportation authorities have the ability to access and change their own transportation information as they see fit. This can include updating fare increases or decreases for certain rides offered by that authority, or altering their mission statement. Also, if a transit authority develops its own website, it can be added as a link to its NDinfo.org informational page.

Summary of Findings

The experiences of SMART, R.Y.D.E., and NDinfo.org provide unique insights that may aid others involved in the design and implementation of ITS. In each case, the organizations view themselves as mobility managers, as opposed to managers of agencies that provide transportation for their communities. As a result, coordination of transportation services was an integral part of the service design. Both the ability to coordinate and the benefits from doing so are enhanced with ITS. ITS technologies provide the capability needed to manage the more complex system. Agencies that are already coordinating their services with others may see further gains in efficiency arise following the adoption of additional ITS technologies.

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