

**DEVELOPMENT OF AN INTERACTIVE PUBLIC AND SPECIALIZED TRANSPORTATION
INFORMATION MANAGEMENT SYSTEM (IPSTIMS): STATEWIDE COORDINATION
LESSONS FROM ILLINOIS**

BY

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Abstract

Development of an Interactive Public and Specialized Transportation Information Management System: Statewide Coordination Lessons from Illinois

Transportation Coordination pertains to service coordination, planning coordination, and financial coordination. Various federal programs have acknowledged the importance of coordination and are making it a mandatory precursor for applying for funding. A scan of literature about coordination indicates that coordination efforts are hampered by a lack of understanding about existing services, turf issues, and the lack of funding. One solution to address this problem has been that of developing and providing comprehensive information management systems (IMS) to all the different stakeholder groups that are part of the transportation arena in the region/state. This also assumes significance in light of the requirements of the Human Services Transportation Plans (HSTP), the Job-Access-and-Reverse-Commute (JARC) application, and the New Freedom application. The level of coordination required as a precursor to successful application in these programs make the need for such information systems extremely important.

The Urban Transportation Center is working with the Division of Intermodal and Public Transportation (DPIT) in developing an interactive public and specialized transportation information management system (IPSTIMS) of statewide transit providers along with the requisite demographic information. This tool is developed in an interactive GIS environment and includes the public and specialized transportation data in the form of projects funded by 5307, 5311, 5310, JARC and New Freedom grants, Title IIB and Title XX programs for seniors, as well as other known human service transportation providers operating within the state.

The paper will explain the development of the application, the data assimilated, and the various uses of the application with the help of interactive queries. The IPSTIMS will benefit different stakeholder groups – ranging from the administrators of funding programs (i.e., DOT), human service transportation coordinators, to mobility managers and other stakeholders in coordination of services, and may also serve as tool in facilitation of the JARC Planning partnerships and New Freedom programming.

1. Introduction

ISTEA, Transportation Equity Act for the 21st Century (TEA-21), Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) & call for the improvement of human services via transportation systems. Each state, with significant input from their metropolitan planning organizations (MPO's), is required to implement improvements to human service provisions in their four year transportation improvement plan (TIP) and their long range regional transportation plan (RTP) (FHA, 2000). Of the three mentioned above, TEA-21 and the SAFETEA-LU, are the more recent surface transportation authorization acts that have emphasized coordination as an effective way to achieve maximum efficiency in the operation of public and human service transportation. SAFETEA-LU stipulated that any projects funded from Section 5310 (Elderly and Persons with Disabilities), Section 5316 (JARC), and Section 5317 (New Freedom) be "derived from a locally developed, coordinated public transit –human service transportation plan (HSTP)" (Wilbur Smith, 2007).

Human service transportation programs generally are defined as services targeting special-needs individuals. Most often, human service transportation programs include senior services, training and assistance programs for the developmentally disabled, youth programs, home health care, congregate meals or recreation programs, etc. As seen above every region is tasked with developing a human service transportation plan (HSTP). This is primarily because of the numerous services operated by the large number of stakeholders at the local level and the lack of knowledge about such services leading to duplication of services, gaps in service, and inefficient use of funds, etc.

The federal regulations have paved the way for transportation coordination, but there needs to be a clear understanding of the complexities and intricacies associated with coordination, in order for the stakeholders and local governments to actually make headway with their coordination efforts. While the mandates refer to coordination as a monolithic phrase, there are different types of coordination when viewed in the context of transportation and a dire need for tools that facilitate coordination. It is the objective of this research to facilitate the HSTP coordination efforts at the regional level across the state of Illinois by developing a interactive information management system. The rest of the paper is divided into the following sections: (1) Importance of Coordination in the transportation sector, (2) The state of coordination in Illinois (3) The use of technology and management systems in transportation coordination, (4) a description of the core application of this research, i.e., the interactive information management system, followed by (5) the benefits of this tool, and (6) the next steps in this research.

2. Importance of Coordination

Transportation is a vital component of health and human service delivery because access to these services often dictates their utilization. Rural areas and small urban areas have traditionally lacked in human service transportation. Coordination refers to "cooperative arrangements between transportation providers and organizations needing transportation services, which improves mobility by improving the effectiveness and efficiency of community transportation." Types of coordination include combining financial resources and capital, eligibility determinations, scheduling, and dispatching with ultimate goal of increasing efficiency while reducing costs. (Simon, 1997, p. 4)

Transportation coordination can result in numerous tangible and intangible benefits. Some of them, as listed in the federal ISTEA and TEA-21 legislations are: (1) *efficient preservation of existing transportation system* (2) *efficient system management and operation* (3) *Enhance integration of connectivity of the transportation system* (4) *Increase accessibility and mobility* and (5) *Support the economic vitality*

This project aims to improve coordination by addressing the above-mentioned themes either directly or indirectly so as to make an impact on coordinated transportation locally, regionally, and at the state level.

Barriers to coordination: While the benefits of coordination are numerous as seen above and discussed later in this paper, the barriers to coordination are significant and primarily stem from turf issues and lack of information. The information barrier is often times the more critical barrier to effective coordination. It is our thesis that in order for coordinated transportation to function smoothly, the flow of information needs to be streamlined and made available to the stakeholders in order to raise the awareness about transportation services, and funding in their immediate vicinity and provide insights into potential opportunities for collaboration and coordination. The use of information management systems to facilitate the flow of information is a growing trend in transportation.

3. Illinois and Coordination

In Illinois, the six-county northeastern Illinois Chicago region is the single largest urban center with densities catering to traditional public transportation systems. The rest of the state contains pockets of high density areas that cater to the needs of the local population with public transportation systems of smaller scale compared to the Chicago region. The needs of the “transit-dependent” population for the lower density and rural areas of the state are met by specialized transportation services that are funded and aided by various governmental funding programs and administered and managed by non-profit entities.

The Illinois Department of Transportation and its Division of Public and Intermodal Transportation (DPIT) has been responsible for the allocation of funds to the various service providers through the different funding streams under its aegis. They have also acknowledged the diverse background of the numerous providers and have supported the formation of the ICCT. The ICCT, in conjunction with IDOT has brought the multitude of transportation providers in the state to understand the barriers and explore the synergies that will eventually lead to a cohesive, coordinated transportation network in the state.

As a first step, IDOT wanted to develop an inventory of its Capital Vehicle Procurement Program and followed it up with a tracking and inventory of its formula funding programs. The impetus behind this move was to facilitate transportation coordination across the state by making the providers and the local governments aware of the various recipients of transportation grants in their immediate vicinity. Subsequent to this was the formalization of a vehicle for coordination in the form of the Illinois Committee for Coordinated Transportation (ICCT).

Past Work

The seeds of the Illinois Committee for Coordinated Transportation (ICCT) were sown with the ad-hoc Interagency Committee for Coordination (ICC) which was convened by involved stakeholders from various agencies as well as the University of Illinois at Chicago in 2001-02. At the behest of the ICC, the

Urban Transportation Center (UTC) was tasked to facilitate transportation coordination by creating a database to assist Illinois state agencies to locate and coordinate transportation services and resources and to track funding streams and to assist in demand evaluation. This task was included as part of the collaboration between the Illinois Department of Human Services (IDHS) and UTC, which was funded through a grant from IDHS to match UTC's JARC grant. The data included in this database were TANF Grants, Title XX grants, and Office of Rehabilitation Services grants from the Illinois Department of Human Services (IDHS), Grants administered by IDOT including 5311, 5310 programs, JARC grants, and the Capital Vehicle Procurement Program, Department of Aging Title XX and Title IIIB grants, Department of Commerce and Community Affairs Community Service Block grants.(2002-03) This database/prototype was developed as a desktop application. This initial effort serves as the background to the current research which makes use of information technology and geographical systems to facilitate the transportation coordination process.

4. Use of Technology and Management Systems in Transportation

Information management systems have different dimensions and have been utilized in a multitude of applications aimed at addressing a variety of problem situations. Information management system denotes a combination of data, models, and technology to disseminate and manage the flow of information to a wide array of customers/stakeholders. Such systems are prevalent in various fields and have been developed to fulfill an array of needs and specializations. In this section, we will look at a few such applications emanating from the transportation literature.

Geographic Information Systems for Transportation (GIS-T) have enabled transportation planners and engineers to manage and visualize transportation data in an efficient manner and have been around for the last decade or so (Miller, 1999). Variations of the GIS-T can be found in the literature pertaining to Spatial Decision Support Systems (Sriraj, et.al, 2006). These spatial approaches have illustrated the immense benefits gained from visually analyzing transportation data. This line of research developed in the last two decades, specifically prompted by advances in spatial analysis techniques and tools,

Thong and Wong exploited the advances in technology and the inherent spatial nature of transportation data to embed a traffic information database in a GIS environment (Thong, and Wong, 1997, Pages 425-443). As the science of GIS evolved, interactive applications on a remote server allowed for end-users/stakeholders/customers to avail themselves of the benefits of technology even if they did not possess the technical know-how or the technological infrastructure to do so. Interactive GIS applications have brought spatio-temporal models and data to end users in an efficient manner (Ziliaskopoulos, and Waller, 2000).

As these applications highlight, technology and GIS have enriched transportation research and made it more efficient and easier to visualize. These advances have more recently been adapted to further the coordination efforts in transportation.

One of the major stumbling blocks in transportation coordination lies in the fact that there are at least three different stakeholder perspectives – those of the clients/users of the transportation systems, the different sectors, and the organizational mission that is unique to each organization. These three different perspectives make the coordination process extremely difficult if not impossible (Schlossberg, 2004).

Given many public services previously delivered by federal and state entities continue to devolve to more local levels of service delivery and programmatic control, inter-organizational coordination serves as an

approach for the public sector to ensure that services are efficiently delivered in a non-duplicative manner. It is in this context that technological methods are being explored to address the gap in facilitating coordination.

5. Interactive Public and Specialized Transportation Information Management System (IPSTIMS)

In order to facilitate coordination and promote efficient information dissemination, the research team designed and developed an interactive information management system powered by ArcGIS and housed in an SQL database at the back-end. Using ArcIMS software, the database and GIS system are linked and can be utilized online: <http://www.utc.uic.edu/tranpro/>. The research is an initiative of the Illinois Department of Transportation, Division of Public and Intermodal Transportation (DPIT) and is being conducted at the Urban Transportation Center, University of Illinois at Chicago. The goal is to develop an interactive information management system of statewide transit providers along with the requisite demographic information. This tool is developed in an interactive GIS environment and includes the public and specialized transportation data in the form of projects funded by 5307, 5311, 5310, JARC and New Freedom grants, Title IIB and Title XX programs for seniors, as well as other known human service transportation providers operating within the state. The data provided by DPIT as well as the Regional Planning Councils (RPC) are housed in a central server at the UTC and is made accessible to all the stakeholders through a secure gateway.

Utilizing available data on the service areas of transportation providers, spatial features were created using Geographical Information Systems (GIS) representing the political boundaries of where and to whom service is provided. These features were then grouped into two “coverages”: (1) public transportation providers (2) human service (specialized) transportation providers. Block group level demographic data allows for spatial analysis from provider service areas up to the regional and statewide level. These data are provided as a separate coverage over the state of Illinois, and are also aggregated within the transportation service areas to facilitate analysis. The resulting product is a spatial database environment with querying capabilities that allow users to extract relevant information with relative ease (Figure 1).

This serves three main functions:

- 1). RPC’s will be able to utilize the software when preparing mandated HSTP planning documents. Statewide regional data have been provided to facilitate the HSTP reporting process and to allow for regional comparisons. This includes demographic data from the Census, population forecasts, and other socio-economic data.

We have combined the provider inventories of all downstate HSTP regions into a single database, geo-coded by county, HSTP region and RPC region. As we continue to develop provider-level data, planners will be able to use the data to identify duplication of services, gaps in service and opportunities to improve efficiency through coordination.

We will also be providing an online data entry interface, allowing HSTP coordinators to provide and maintain their own data on the server.

2).The application will be available for limited public access providing mobility managers, transportation agencies, and other stakeholders with useful provider-level information. IDOT maintains control over what and how the data are presented. IDOT can also maintain its own data on the server and in doing so can set data standards to meet federal reporting requirements.

3). Coordinators at the regional and state level will be able to create their own maps, queries, and can access the GIS coverages and other data in a downloadable format.

The tool is intended to help transportation planners with knowledge of the transportation services funded across the state of Illinois by the various funding streams along with detailed demographic information about the service area for each provider. This information will allow the HSTP coordinators to

- **Identify Service Duplication and Gaps in Service:** Well-defined service areas have been converted to a GIS format, representing the areas providers serve by residential eligibility. This will allow for service duplication to be identified as well as identification of gaps in service.
- **Identify latent demand:** Underlying base-level data have also been developed, including demographic and economic data that can be used to identify latent demand for services.
- **Perform demand analysis:** By integrating the provider data with the socio-economic data, the demand for services can be evaluated within the context of existing services.

Apart from these functionalities, the IPSTIMS provides other tangible and intangible benefits.

6. Benefits of IPSTIMS

The IPSTIMS allows for seamless data dissemination to anyone with access to the internet. The complications of ensuring data quality, data storage, and data visualization are minimized because of the central storage and data delivery enabled with the help of this technology. The most unique feature of this application is that it caters to the level of geographic resolution sought by the stakeholder with the help of spatial queries. High –level users such as state agencies or RPC’s have the ability to maintain their own data, data standards and also may control what data are shared publicly. This allows for transportation coordination at different levels of agglomeration –be it at the local, regional, or state level. The data are available and can be parsed depending upon the need.

One of the indirect benefits to be gained from participating in the development of this system will likely be consensus on data needs. The data needs and priorities of human service agencies and transportation agencies are different. It is therefore reasonable to expect that human service agencies providing transportation will need help in developing data sufficient to meet the needs of Human Service Transportation Plans as well as federal transportation grant applications and reporting requirements. The researchers hope that the IPSTIMS will assist HSTP coordinators in developing appropriate data template for human service transportation providers to meet those needs. Such a template would also create data at a level of detail allowing for local and regional comparisons and in depth analysis of the transportation services being offered.

In the future, detailed data development on the part of the human service transportation coordinators and providers will allow for analysis of individual service efficiencies, and ultimately will enable broader analysis of overall system efficiency. Improved data development will also facilitate analysis that may predict outcomes and impacts of specific coordination efforts. These goals can be met only with significant time, effort and political will on the part of the various stakeholders who are dedicated to transportation coordination. The IPSTIMS has the potential to serve as the repository and distributor of detailed and relevant data to stakeholders. As stakeholders realize the benefits of utilizing an information management system, it is hoped that data development despite its inherent difficulties will be more readily embraced.

The uniqueness of this application lies in the fact that it is a tool that facilitates coordination. As evidenced from the literature on coordination, the federal government requires coordination at the local and state level, and the success or failure of the resulting coordination efforts is more readily measured. The gap in this process is in the methods used to facilitate coordination. It is in this area that this application fills a need. The neutrality of an academic institution housing and maintaining the data makes this a rather unique feature of this product and presents an interesting model for other states to follow.

7. Next Steps

The lessons learned from this research have offered a tremendous insight into the possibilities for future applications with the help of this technology. The authors are exploring the possibility of extending this analysis and adding more coverages and data.

Over the next several months, the authors envision adding employment data at the county and zip code level, and possibly more detailed information pertaining to socio-demographics of the population. We hope to continue to develop information such as detailed fleet and ridership information from the HSTP Provider Inventories and from IDOT.

HSTP efforts are not just about coordination; they also address facilitating the grant application process for JARC and New Freedom grants. (5311 application process is facilitated through ICCT technical assistance) as discussed in this paper. Future efforts will focus on developing data standards and tools for spatial analysis that will help applicants devise strategies to meet these requirements.

We hope to conduct stakeholder needs analysis in order to determine what specific queries and analysis tools are to be customized and developed as part of the system. We will continue to develop tools and interfaces to assist all levels of stakeholders in accessing, maintaining and analyzing the data, directly and through the use of GIS tools. Continuation of the data dissemination process between UTC and HSTPs (ii) increased involvement of data housekeeping by key stakeholders. (iii) Stakeholder input and involvement on the structure of IIMS will be an ongoing process. (iv) Change of data needs

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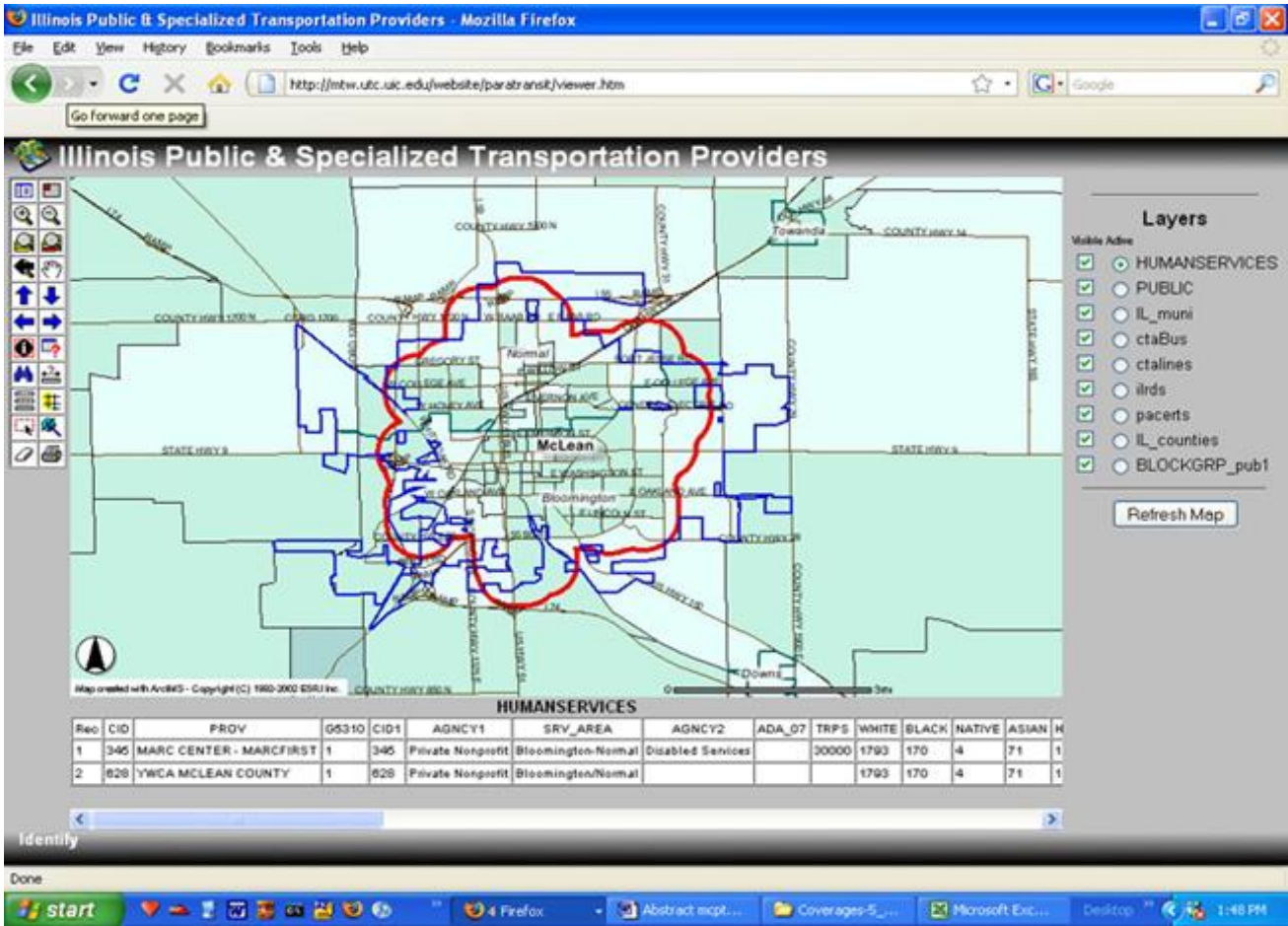


Figure 1. IPSTIMS Depiction of Bloomington-Normal