Approaches to Passenger Information for Public Transit: Application to the San Juan Metropolitan Area

Mikael Sheikh

Executive Summary
May 28, 1998

1. Research Objectives

The primary objective for this research is to investigate the ways in which one could improve the quality of passenger information for the various transit services in the San Juan area. Improving passenger information about public transit can hope to accomplish a variety of goals, including:

- increasing the efficiency with which passengers use transit,
- increasing public awareness of transit services available, and
- providing information to current users that increases their level of satisfaction with the service.

By investigating ways of improving the quality of passenger information for transit in the San Juan area, I hope to suggest a passenger information plan that could help achieve these and other goals for transit in the region.

A secondary objective lies within the need for a framework to guide the transit agency's or region's decision-making with regard to improving the quality of passenger information they provide. The research will consist of a review of existing literature, a survey of passenger information methods and technologies in use, and a detailed examination of several specific implementations. From this I will identify the various criteria that are important in evaluating a method with respect to the particular goals it was expected to meet, and suggest a process for making passenger information implementation decisions.

A full spectrum of methods for providing transit passenger information will be examined, from the traditional paper schedules and customer service telephone numbers to advanced systems such as "next bus" displays. In particular, the value of real-time information versus static information will be examined.

Note that the term passenger information "method" is used in this summary in place of the more commonly used term "system," as the latter can be misinterpreted to include only high-technology options.

2. Motivation

The San Juan Metropolitan Area suffers from tremendous congestion problems caused by a nearly complete dependence on the automobile for urban travel. Unfortunately, the use of public transit as an alternative has been declining with time. In response, the Commonwealth of Puerto Rico is taking steps to improve the quality of public transit in the San Juan region, by both redesigning existing transit services and adding others. In particular, the Tren Urbano heavy rail rapid transit line scheduled to open in late 2001, provides a tremendous opportunity for regaining some of transit's decreasing ridership.

Several characteristics of public transit service that distinguish it from automobile travel create a reliance on passenger information to make these services useful. Fixed-route transit serves only a fraction of city streets, and it is likely that a particular route that serves the origin of a particular trip does not serve the corresponding trip destination, requiring a transfer between routes. Transit services are not provided continuously but rather at discrete time intervals, either scheduled or demand-responsive, and scheduled transit services are often unable to keep perfectly to their schedules. Finally, there are many service-specific rules regarding transit use, such as what fare needs to be paid. As a result, both existing and potential transit passengers are at a disadvantage when the quality and/or quantity of information provided about available services is poor.

The primary motivation behind this research is that a careful consideration of how passenger information is, and how it can be, provided to the public can be of significant impact on the quality of transit service in the San Juan Metropolitan Area. Subsequently, relatively small investment in improving passenger information could produce a significant return in terms of increasing transit ridership and passenger satisfaction.

3. Research Methodology

This project will be carried out in the following eight steps:

1. Identify passenger information concepts

The starting point for this research is to review existing literature about Advanced Traveler Information Systems (ATIS) to identify concepts related to passenger information, including potential audiences, technologies, types of information, and potential benefits.

2. Identify and characterize the different methods

The second step is to develop a summary of the full range of passenger information options. Information will be collected from the literature review. While North America will be the focus of this investigation, some effort will be directed at European, Asian, and Latin American cities.

3. Formulate a set of evaluation criteria

From the lessons learned in the literature review, I will develop a set of criteria for evaluating and, where possible, quantifying the benefits and costs of passenger information methods. The criteria will consider all direct benefits and costs of the methods, including benefits to passengers of both real and perceived service quality improvements, costs to users in terms of money, time, and complexity, and the benefits and costs to the transit agency. Equity issues will also be considered, primarily from an evaluation of the effective audiences of methods.

4. Develop a decision-making framework

These evaluation criteria will then be incorporated into a framework for selecting and evaluating passenger information plan alternatives. This will provide a process for regional and transit agencies to make decisions about implementing passenger information methods. The basic steps in this process are to:

- identify the agency's goals in making a change,
- identify the context in which the decision is being made,
- select appropriate methods for meeting these goals,
- perform an evaluation of the alternatives, and
- select and implement the preferred option or set of options.

The framework will be developed with two purposes in mind: for selecting a particular passenger information method for one or more transit services, and to assist in developing a coordinated passenger information plan on an agency-wide or regional level.

5. Examine several implementations of interesting methods and technologies

As a means of verifying the evaluation criteria and framework, several case studies will be examined in detail to evaluate or identify the success of these implementations in meeting the goals and objectives they were intended to meet. Case studies include: real-time bus stop arrival-time systems in London, England, Southhampton, England and Gothenburg, Sweden; a kiosk system in Los Angeles, California; and Internet-based systems such as those provided in the San Francisco Bay Area. A study of the comprehensive passenger information programs of two San Francisco Bay Area transit agencies, as well as regional coordination efforts, will also be included. In addition, an effort will be made to select at least one case study of an Asian city with jitney service, and again a Latin American city that may be more representative of the San Juan context.

6. Refine the evaluation criteria and decision-making framework

Based upon lessons learned from the case studies, the evaluation criteria and decision-making framework will likely need refinement. In addition, information learned from the literature review may need updating to reflect the results of the case studies.

7. Identify key characteristics of the San Juan region and problems with the current state of passenger information

The first step in applying the knowledge learned from this research is to describe the environment in San Juan as it pertains to public transit and passenger information. Information about the people of San Juan and the current public transit system will be gathered from existing literature and correspondence. I will research the recent history of passenger information provided for these transit services, and will develop a summary of existing problems with transit information in San Juan. Some thought will also be given to how the introduction of the Tren Urbano heavy rail system will affect the demands on transit passenger information in the region.

There are at least two issues regarding the San Juan Metropolitan Area that need attention. First, the privately operated públicos are a significant challenge in terms of passenger information. They are characterized by a lack of schedule, although públicos in San Juan generally do follow a fixed route. It is also probable that the government would have to assume responsibility for providing information about these services. Thus, I hope to identify and study examples of cities with público service where some level of information is provided to the public.

Secondly, due to cultural differences, the values and perceptions of Puerto Ricans are likely to be different from those in the continental United States. Thus the impact that a particular passenger

information method has on a passenger in San Juan may not be the same as the impact on a passenger in the continental United States. While a careful examination of these cultural differences falls outside the scope of this project, at least one case study will be selected from cities in Latin America, which may prove more representative of the Puerto Rican people.

8. Develop an implementation plan for the San Juan region.

In proposing a plan for the San Juan Metropolitan Area, I will first develop a set of goals and objectives for improving passenger information in the region. These goals will be drawn from both those identified by agencies providing transit service in San Juan as well as those arising from review of the case studies and examination of the San Juan context. Potential methods for providing passenger information will be identified for each transit service. The alternatives will then be analyzed using the evaluation criteria and decision-making frameworks developed. This analysis will be performed first for each transit service and then for the region as a whole. It will be based on both the existing transit system as well as the system after the introduction of Tren Urbano.

4. Key Findings to Date and Implications for the San Juan Metropolitan Area

4.1. The Decision-making Process

The variety of passenger information options in use in the transit industry is tremendous, and the issues governing the degree of success of any particular implementation are complex. The keystone to this research is therefore a general framework for making passenger information implementation decisions. This eight-step framework is summarized here:

1. Identify local context – Identify the characteristics relevant to the need for and use of transit passenger information in the local region, considering issues related to the agency and the customer.
2. Define goals for passenger information – Based on the customer and agency needs identified in Step 1, define a set of general goals for transit passenger information to meet.
3. Evaluate existing passenger information – Based on the goals defined in Step 2 and the relevant local characteristics, evaluate the impact of existing transit passenger information, watching in particular for ineffective methods and goals that are not successfully addressed.

4. Define goals and objectives for improving information – Formulate a set of specific goals and objectives for transit passenger information improvements to correct the shortcomings identified in Step 3.
5. Identify key evaluation criteria – Identify the evaluation criteria relevant to analyzing passenger information in consideration of the specific goals for improvement defined in Step 4.
6. Select implementation alternatives – Select a set of passenger information methods that address some or all of the goals defined in Step 4.
7. Evaluate the alternatives – Using the evaluation criteria identified in Step 5, evaluate the selected alternatives in terms of both cost-effectiveness and their ability to meet the goals laid out earlier.
8. Implement the preferred alternative(s)

The key steps in this process, identifying the local context, selecting implementation alternatives, and evaluating both the existing information program and selected alternatives for improvement are described in further detail.

4.1.1. Identifying the Local Context

The three key areas in which local characteristics impact the evaluation, and therefore, selection of passenger information improvements, are the current situation of the transit agency (or agencies) affected, the demographics of transit customers (both potential and existing), and the specific needs of these customers.

An agency's objectives in implementing a new passenger information method depend heavily on characteristics specific to that agency. Issues of importance include the agency's age and ridership stability, and of course, considerations such as budget constraints, staff resources and local expertise.

Many factors influencing the impact of passenger information to a user can be generalized over specific subsets of the population. Distinguishing characteristics include age, gender, trip purpose, frequency of transit use, familiarity with transit service, familiarity with the local geography, and knowledge of the local language. One should classify the transit ridership into a number of market segments representing the major divisions in their use of and needs for information. Then the use and benefits of a particular passenger information method can be evaluated for each of these segments. Prioritizing market segments is also an important part of the process – it can be impossible to meet all needs of all users. Prioritization should be based upon several factors,

including the transit agency's service mission, the ridership market split, and comparative levels of transit dependency.

Customer needs can be determined explicitly by market research, through any of the traditional methods such as surveys, focus groups, and from direct customer comments and complaints. However, relying solely on direct customer input can limit both the range of customer needs that are identified and the range of alternatives that are considered. It is therefore important also to look at the activities of other transit agencies and determine if there is need for similar improvements within the local implementation.

4.1.2. Selecting Implementation Alternatives

Selecting alternatives from the range of passenger information options, from paper schedules to Internet bus arrival time systems, is achieved by answering a series of five simple questions:

- Who is the intended audience?
- Where is the information needed?
- What are the audience's information needs?
- What information will satisfy these needs?
- What alternatives can provide this information to the intended audience?

The first three follow from the prior discussion of analyzing the local context. Once these critical questions are assessed, identifying alternatives is straightforward.

4.1.3. A Framework for Evaluation

The evaluation framework developed in this research is intended for use in:

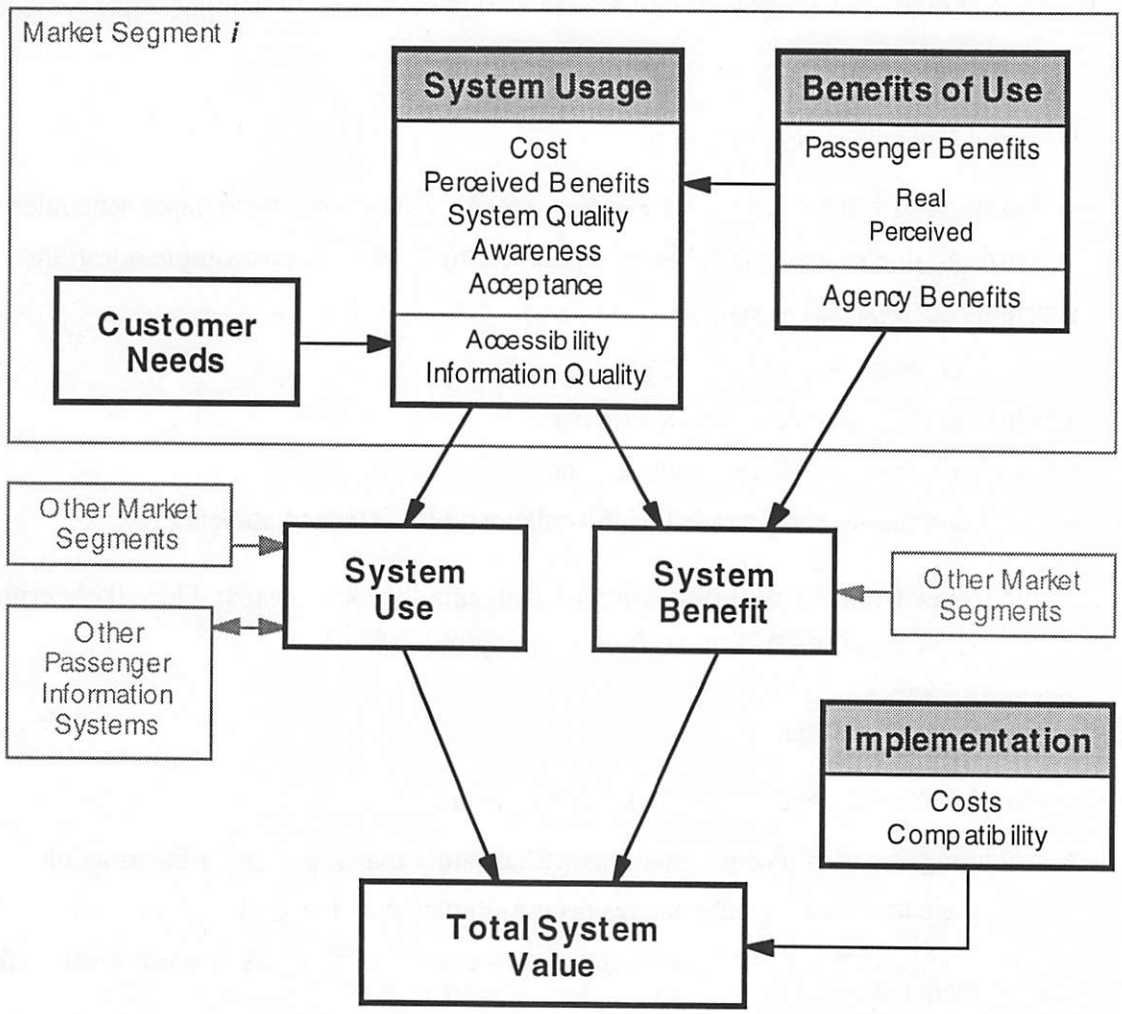
- evaluating and identifying limitations with existing transit passenger information,
- selecting and evaluating alternatives prior to implementation, and
- developing a program for evaluating the performance of the chosen alternative(s) after implementation.

Driving the structure of this framework is the issue that the use, acceptance, and benefits of a transit passenger information method are dependent on characteristics of the user, such as age, gender, trip purpose, and other parameters. Therefore, in order to evaluate a passenger information method accurately and comprehensively, one must first divide potential users into appropriate market segments as described earlier and then analyze the various impacts of the method for each group of users, keeping in mind the priorities determined for each segment.

The evaluation takes place in three stages, analyzing factors which:

- influence the use of passenger information methods by a particular customer,
- influence the benefits of information provided to a particular customer or the transit agency (or region), and
- influence issues relating to method implementation.

The figure below illustrates the proposed evaluation methodology, in which the three evaluation stages mentioned above are represented by the three boxes with shaded headers.



An Evaluation Framework

Evaluation is performed per each market segment identified in the earlier stages of the process. An estimate of the value of a method to users in a particular market segment is simply the product of the likelihood of a customer using the information provided and the expected benefits of using the source. The average of these values over all market segments, weighted by the size of each segment and the priority given to that segment, gives an estimate of the total value of a method to a random member of the public.

The method use evaluation is a key component in the framework. An individual's decision to make use of the information provided to them can be separated into three key stages: awareness of the method, a trial use phase, and repeated use of the source indicating acceptance of the information. The decisions made at each of these stages are influences by several factors characteristic of the information method and the user:

- **Awareness** – the user's information needs, initial attitude toward transit information, and exposure to the method
- **Trial Use** – the costs of using the method, the method's accessibility, and the expected passenger benefit
- **Repeat Use** – the costs of using the method, the method's accessibility, reliability, information quality, credibility, and realized passenger benefit

The success of a passenger information method from the user's perspective is largely determined by the benefits the user can realize from the information. There are also several benefits the transit agency(ies) can enjoy. These benefits are summarized in the following table:

Type	Benefit
Real Passenger Benefits	Travel time savings Travel time efficiency
Perceived Passenger Benefits	Travel time savings
Psychological Passenger Benefits	Travel time savings Confidence and stress Security Method perception
Agency Benefits	Ridership Method efficiency Method perception Indirect benefits

Potential Benefits from Passenger Information

4.2. Issues in Providing Regional Transit Information

With the introduction of Tren Urbano, the roles of many existing transit services will transform into feeder services. To facilitate this intermodal concept it will be necessary to provide consistent, integrated transit passenger information. Additionally, evidence from the San Francisco Bay Area indicates that there is often resistance to one transit agency providing information about another's services. There are two reasons for this – first, agencies are ultimately accountable for their own service, and thus are hesitant towards giving "control" to others providing their information. Secondly, agencies fear that the availability of information about other services from their

telephone information officers, for example, will increase the demand for and workload on these operators, and subsequently the cost.

A solution to these concerns is to establish one umbrella entity responsible for providing passenger information for all transit services in the region (either exclusively, or in addition to each agency providing information about its own services). In the San Juan situation, this role could be assumed by the D.T.O.P., or given to the Tren Urbano operating team.

The complexities in providing regional information is furthered in the San Juan case. The majority of transit service today (and consequently, the majority of feeder service in the future) is provided by private público operators. This can place limitations on the type of information available to the public, as operators engaged in competitive service may resist providing detailed information (especially in real-time) which could give their competitors an advantage. A solution here could be to require the release of such information in return for an operating license or public subsidy, thus making similar information available for all público operators.

4.3. The Real-time Information Paradox

The value in providing real-time information is greatest for relatively unreliable transit services. Unfortunately, the costs of providing this information is generally quite high, and thus justifiable only on well-used services. This forms a paradox, as routes with the highest ridership are often those with the most reliable service (or a service frequency great enough that reliability is not an issue). This is certainly the case with the Metrobús routes in San Juan, and will likely be true with Tren Urbano.

However, the costs of providing real-time information in rail stations and at transit centers tends to be less than at remote stops (due to lower communications costs and a reduced incidence of vandalism and environmental stress). Thus, one could provide at Tren Urbano stations and the other designated transit centers real-time information about the less-reliable bus services. Supplementing this with real-time information available from the home or office (via telephone or other means) should attain the majority of the benefit.

5. Work Plan for the Remainder of the Project

Research has thus far been completed for Tasks 1-4, is 70% complete for Tasks 5 and 6, and 25% complete for Task 7. Thus the priority now is to complete the case study research and subsequent refinement of the evaluation and decision framework, as well as concentrate on examining the San Juan context (Task 7). When this is complete, Task 8, the development of an implementation plan

for the San Juan region, can begin. In addition to performing this research, I am in the process of documenting the results in a Master's thesis which shall be complete in August, 1998.

A more detailed summary of the remaining work plan follows:

5. Examine several implementations of interesting methods and technologies

Information still needs to be gathered and analyzed for the two most remote case studies. I have narrowed down the potential Latin American options to Caracas, Venezuela and Santiago, Chile, and will decide between the two based on the quality of data about passenger information that is obtainable for each. The other goal is to study a city in Far-East Asia with prevalent use of privately-operated jitneys. Hong Kong and Manila are the best candidates, but again a decision will be made based upon the quality of available information.

7. Identify key characteristics of the San Juan region and problems with the current state of passenger information

There are four main tasks that need to be performed for this step:

- confirm and update information collected to date regarding the current state of transit passenger information in San Juan,
- consult with staff at A.M.A., D.T.O.P., and consultants about their concerns and goals for both passenger information and transit service in general,
- consult with the Tren Urbano office and contractors as appropriate to learn about information plans for Tren Urbano, including issues of station and platform signage and communications, in-vehicle information, and pre-trip services, and
- identify any issues regarding transit passenger information learned from the case studies which may transfer to the San Juan context.

8. Develop an implementation plan for the San Juan region.

An implementation plan will be developed by following the decision-making process outlined in Section 4.1 above. Clearly the level of detail of the analysis is limited by the availability of relevant data and the limited scope of this thesis project. However, based upon the knowledge accumulated over the course of the research and specifically from Step 7, a two-phase plan can be developed, covering both the current transit system and the system after the introduction of Tren Urbano.