

TRAVEL BEHAVIOR PANEL

Before and After Tren Urbano

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1. Title

Travel Behavior Panel, Before and After Tren Urbano

2. Purpose

The main purpose of this research is to study of the travel behavior changes resulting from the introduction of Tren Urbano in San Juan, Puerto Rico.

3. Objectives

- To examine the San Juan Regional Transportation Model in order to review the ridership focusing in the first assumptions made when the model was developed and to assess their validity under the current conditions.
- To understand the current travel behavior of San Juan travelers.
- To design a panel survey to study the impact on the travel behavior of San Juan travelers, resulting from the introduction of Tren Urbano

4. Motivation

There is no doubt that large transit systems induce changes in the mobility patterns of cities. There is also evidence that San Juan travelers are responsive to improvements on transit. During the last five years, San Juan has seen improvements on the service quality provided by AMA. These changes have produced an increase in the daily ridership as shown by the next figure.

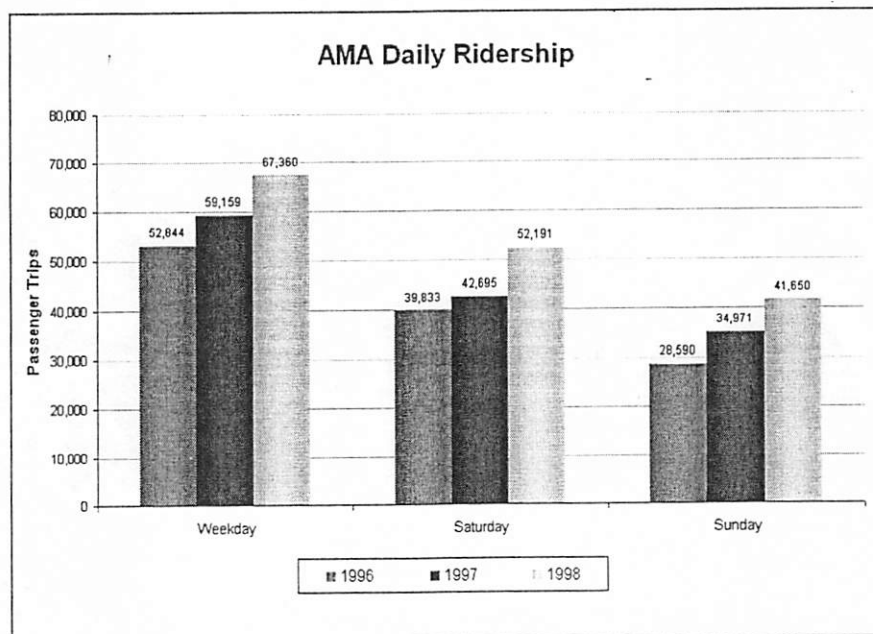


Figure 1. AMA Daily Ridership. Source: Vargas J., The Metropolitan Bus Authority of Puerto Rico: A case study of transit management strategy. Massachusetts Institute of Technology. Transit Management Term Paper. (fall, 2000)

Moreover, the number of usual riders owning an automobile has followed a similar trend.

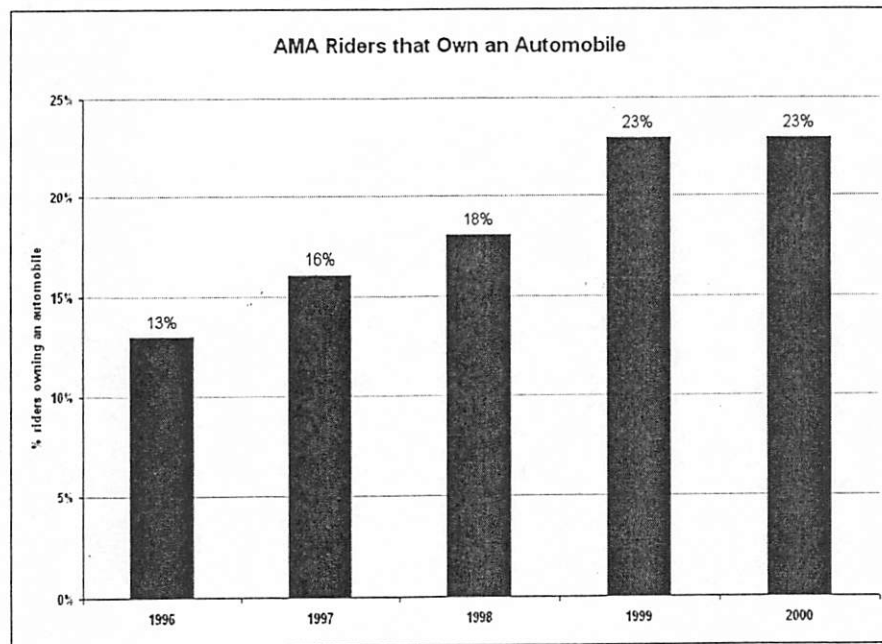


Figure 2. Ama riders that own an automobile, Source: Vargas J., The Metropolitan Bus Authority of Puerto Rico: A case study of transit management strategy. Massachusetts Institute of Technology. Transit Management Term Paper. (fall, 2000)

On the other hand, the city of San Juan is also concerned about congestion and traffic problems. This general concern is included in the Tren Urbano Final Environmental Statement that states “only those that do not have a car use the public transportation system”. In addition, the San Juan Regional Transportation Plan reports that the daily trips modal share of private auto has grown from 62% in 1964 to almost 92% on 1990.¹ Following the results on AMA ridership two questions emerge, What is driving some auto users to switch to transit? What particular features of the improved AMA service have had the major effect on riders? Those are relevant questions to be asked by the transit industry in San Juan. Tren Urbano will have a larger effect over the mobility patterns in the city, than the AMA and Metrobus improvements. Hence, it can be expected that in the near future similar question will rise. The answers to those questions are helpful to understand Tren Urbano customer’s behavior and therefore can be used as marketing tools. At the same time,

¹ FINAL ENVIRONMENTAL STATEMENT APPENDICES, Tren Urbano San Juan Metropolitan Area, Puerto Rico. November 1995. US DOT, FTA, Government of Puerto Rico, Department of Transportation and Public Works, Highway and Transportation Authority.
SAN JUAN REGIONAL TRANSPORTATION PLAN, Commonwealth of Puerto Rico, Department of Transportation and Public Works, Highway and Transportation Authority. BARTON-ASCHMAN ASSOCIATES INC. March 1993.

those answers might be useful in future evaluations of the performance of Tren Urbano.

Furthermore, the introduction of a large transit system is seldom seen in the world, and Tren Urbano provides an exceptional opportunity to study the impacts mentioned in the foregoing paragraphs.

The results of this study can be used by Tren Urbano to:

- Develop demand models to forecast ridership and test operational alternatives in the near future.
- Define market strategies based upon the behavior of San Juan residents to attract and retain more riders.
- Conduct future survey to assess the impact of policies in the transportation system as they occur.

5. Research approach and progress

The following table summarizes some of the changes resulting from the improvements of the last ten years, it also includes an early attempt to describe some of the effects of Tren Urbano over the trip attributes.

Characteristic	Transit System Before Improvements (1995)	Current System (1995- 1999)	Tren Urbano and new bus system
Frequency (out-of-vehicle time)	--	0	++
Directness of Service (in-vehicle time)	--	0	++
Speed (in-vehicle time)	--	-	++
Coverage (walk distance)	++	++	+
Connectivity (number of transfers)	++	0	0
Fare (cost)	++	++	0
Schedule Adherence (reliability)	--	0	++
((++) (Very) Good, 0 Neutral, (-) - (Very) Bad)			

Being **Transit System Before Improvements**, the system in place until 1995; **Current System**, the existing service provided by AMA, Metrobus and Publicos and, **Tren Urbano and new bus system**, the system composed of the rail line and the adjustments to the bus system. These changes can be understood from the standpoint of the perceived attributes of a trip, basically time and cost. It can be presumed that under the new system, some travelers will face a new alternative offering savings in out-of-vehicle and in-vehicle time while the fare and the number of transfers may

increase with respect to the current situation. Three additional issues included in Tren Urbano, can also modify travel behavior and mobility patterns: new technology such as the one planned for the fare media, a greater concern for service reliability, and public information. Nonetheless, trip attributes cannot be seen as the solely cause of travel behavior changes, instead, a combination of trip attributes and rider's social and economical characteristics might explain modal shifts, ridership increments, etc.

Anticipating the change, a Panel Study emerges like a convenient tool. A panel survey is a longitudinal-type periodic survey designed to be repeated several times during a predetermined period. A panel survey allows:

- Identification of changes in travel behavior
- Explanation of these changes
- Understanding the outcome of a certain transport policy.²

A Panel provides more information than alternative survey tools such as cross-sectional data analysis. The following example shows the added value of a Panel study.

CROSS - SECTIONAL DATA				
	AMA	Publicos	Others	Auto
1964	19.6%	9.2%	8.5%	62.7%
1976	8.0%	7.7%	2.5%	81.8%
1990	2.4%	3.7%	2.0%	91.9%

HYPOTHETICAL PANEL SURVEY						
		1990				
		AMA	Publicos	Others	Auto	
1976	AMA	1.1%	0.2%	0.2%	6.5%	8.0%
	Publicos	0.5%	2.9%	0.3%	4.0%	7.7%
	Others	0.6%	0.2%	1.3%	0.4%	2.5%
	Auto	0.2%	0.4%	0.2%	81.0%	81.8%
		2.4%	3.7%	2.0%	91.9%	

The first table reports the findings of three transportation surveys as included in the San Juan Regional Transportation Plan (1993). The second table is a hypothetical Panel Survey summary constructed to show some of the advantages of a Panel Survey. Both analysis show that transit ridership decreased steadily from 1964 to 1990. However, if the following questions are posed:

² Van der Loop H. Panel Analysis of Travel Behavior for Policy Applications: Methods Used and Results Available. (1990) Development in Dynamic and Activity-Based Approaches to Travel Analysis. Oxford Studies in Transport.

- Did some AMA riders switch to Publico between 1976 and 1990?
- Are there any 1976 auto users riding transit?
- How many of the 1976 Publico riders are still using the same mode?

Only the Panel survey analysis can answer them. (Yes, 0.2%; Yes 0.2% AMA, 0.4% Publicos; 2.9%).

Moreover, since the social and economical characteristics of the sample are known, a possible explanation of these changes can be found.

Panels have been extensively used over the last 30 years in different areas such as labor market, crime studies, medicine, sociology and political science, among others. However, there are only a few well-documented transportation panels in the literature.³ The most relevant being:

Mobility panel survey	Study objective
Dutch National Mobility Panel	General purpose
Puget Sound Transportation Panel	General purpose
Toronto Panel Survey	Public Transport demand elasticity
Automobile Demand Project	Motorization trends and private vehicle use
"Estudio Corredor N-VI"	Incentives effects on Public Transport use
North European HTS Panel	Influence study of High Speed Rail service on people mobility
London Travel Diary Panel Survey.	General purpose
Greater Manchester Panel.	Changes in bus use due to deregulation
South Yorkshire Panel	Household motorization trends
San Diego I-15 Panel Survey	Influence study of High Occupancy Vehicle lanes on people mobility
Littlemore Bus Service Change Longitudinal Study	Influence study of bus service level on its users

Source: Ruiz T., Colomer J., A REVIEW OF GENERAL AND MOBILITY PANEL SURVEY METHODOLOGY: SOME FINDINGS. Technical University of Valencia, Spain. (2000) Forthcoming.

In order to design and conduct a Panel Survey in San Juan, an assessment of the current conditions must be completed. The San Juan Regional Transportation Model is the main source of information in this regard, as well as recent reports on AMA, Publicos and Metrobus performance.⁴

³ Ruiz T., Colomer J., A REVIEW OF GENERAL AND MOBILITY PANEL SURVEY METHODOLOGY: SOME FINDINGS. Technical University of Valencia, Spain. (2000) Forthcoming.

⁴ SAN JUAN REGIONAL TRANSPORTATION PLAN, Commonwealth of Puerto Rico, Department of Transportation and Public Works, Highway and Transportation Authority. BARTON-ASCHMAN ASSOCIATES INC. March 1993.

However, The San Juan Regional Transportation Model was developed in 1993 using data coming from several transportation surveys carried out in 1990. During the 10 years that followed the development of the model, San Juan urban structure, transit service quality, as well as the alignment and operational strategies for Tren Urbano have changed. Therefore, an evaluation of the model focusing in the revision of the assumptions made in the 1990's to estimate the ridership is important from two viewpoints. In the first place, to establish a framework to characterize current travel and secondly, to review the figures for ridership. In this regard, this research will include the following tasks:

1. To gather and review existing demand and supply data; the main tool to undertake this task is GIS analysis ⁵.
2. To compare the existing data with the assumptions, projections, alignment and operational standards assumed when the model was used to estimate the ridership figures.
3. To estimate possible changes in the ridership figures focusing in the current validity of the assumptions.

Once the current setting is established, the next task is to design the panel and if possible to undertake the first panel wave. Subsequently, I will define the methodology to develop a dynamic behavior study using the data collected in subsequent waves. Some of the above enumerated mobility panels have been already reviewed and will be the main source for future work. There are some lessons learned from all the panels leading to important questions that have to be addressed in the design of the Tren Urbano Panel, the most important being:

1. *What should be the sample unit?* There is a discussion on whether households, addresses or individuals should compose the sample unit for a panel survey. Each of the three alternatives has pros and cons that the designer has to take into consideration when deciding the sample unit. The San Juan demographic context, accounting for, at least, family structure and migration patterns will be evaluated to address this problem.
2. *What should be the sample size?* In order to estimate a representative sample for each wave of the panel some considerations have to be made regarding the initial sample size and mechanisms to

⁵ Ming Zhang's "Job Accessibility in the San Juan Metropolitan Region – Maximizing the Benefits of Tren Urbano" (1999) has been the main source.

cope with possible attrition in subsequent waves. Some consideration to refreshment of the sample should also be made at this stage.

3. *When should the first wave take place?* Tren Urbano opening day is scheduled for 2002, a final outcome of this research must be the date when the first wave of the panel should be carried out. This is an important question because it is important to assess the possible date when commuters start adjusting travel behavior if they do it at all.
4. *What should be the time span between successive waves?* It is important to decide how many waves should be carried out before Tren Urbano operation and following its opening to the public when subsequent waves should be carried out.
5. *Which method should be used to conduct the survey?* Prior panels have used different approaches to conduct the survey. Today's technology allows the use of less costly techniques, in terms of data processing, however the final selection has to be analyzed accounting for the social and economic characteristics of San Juan commuters. It also depends on the sample size and on the sample unit.
6. *What should be the best manner to keep track of household or individuals during the period between waves?* Between waves it is usual to lose track of individuals or households within the sample unit. To avoid this some techniques can be used; again new technologies such as the Internet can be used to address this issue. However, the answer to this problem lies firstly in the panel method that is going to be chosen to develop the survey and in the sample unit section.

Finally I will issue recommendations on how the information provided by the panel study can be useful to define policies for the management and marketing strategies of Tren Urbano. It is important to state that the panel design will be undertaken considering future waves conducted by Tren Urbano Office. In this sense the guidelines as well as the objectives must be clear in order to achieve continuity in the development of the panel.

Some relevant research areas covered by this research are:

- Demand Model
- Travel Behavior Panel
- Transit Marketing

6. Advisors

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