Assessment of the Puerto Rico Transportation Technology Transfer Program in Promoting Engineering Education

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Abstract

Since 1986 the Puerto Rico Transportation Technology Transfer (T_) Center of the University of Puerto Rico at Mayagüez established and developed capacity building programs in transportation and engineering related disciplines in Puerto Rico and the US Virgin Islands. The main focus areas of the Center's activities are transportation safety, infrastructure management, workforce development, and value delivery. The challenges that faced the transportation profession during these last 23 years opened a window of opportunities for the Center to collaborate and actively participate, in a bilingual setting, in several innovative educational and professional development programs of local, national and international impact.

This paper provides an assessment of the training, research and education programs managed by the T_ Center, and its future challenges to continuously play an active principal role to impact the training and professional development at all levels of engineering education.

INTRODUCTION

The Puerto Rico Transportation Technology Transfer Center (T_) was created on April 1, 1986 in the Department of Civil Engineering of the University of Puerto Rico at Mayagüez (UPRM) as part of the Federal Highway Administration (FHWA) Rural Technical Assistance Program (RTAP) that emphasized technical assistance to local transportation officials in rural communities. The principal objectives of the T_ Center in its beginning were to [1]:

- Transfer the significant research findings that have been conducted in the United States and abroad to local municipalities in the Island in a concise format
- Train highway personnel in areas related to new construction and rehabilitation techniques, maintenance strategies, and pavement management
- Keep local highway and municipal officials current with the new technology already available in the areas of road design, construction, programming, and pavement maintenance, evaluation and rehabilitation.

With the enactment of the United States of America's Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991, the RTAP became known as the Local Technical Assistance Program (LTAP). Currently, the program is composed of a network of 58 centers; one in every state, Puerto Rico and regional centers serving tribal governments in the United States. The accomplishment of the LTAP toward improving the skills and increasing knowledge for the surface transportation workforce and its decision makers has resulted in local transportation agencies saving an estimated $8 for every $1 LTAP spent on information and training [2].

The T_ Center has evolved significantly maximizing its strategic location within a university setting in the Caribbean, our access to students and faculty members from various disciplines and campuses, our bilingual capabilities, and the ever changing local and internation-

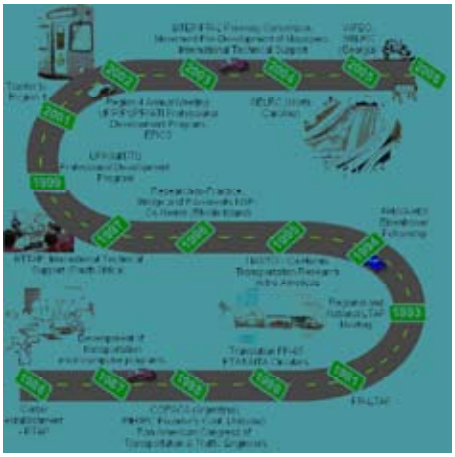

FIGURE 1
Evolution of the puerto roco t_center

al transportation needs. Figure 1 shows the main activities, programs and services that have been conducted by the T_ Center during its first 23 years that will be described in detail in the subsequent sections.

AN OVERVIEW OF T_ CENTER MAJOR TASKS

The T_ Center has accomplished its initial tasks and objectives which resulted in new special projects that complemented the technology transfer tasks and other related activities to the professional development of students, the planning and coordination of local, national and international conferences, and the provision of international technical assistance in transportation related disciplines.

I. Seminar Program

The seminar program is aimed to local transportation officials that comprise the 78 municipalities of the Government of Puerto Rico, the Puerto Rico Department of Transportation and Public Works (DTPW) and the United States Virgin Islands Department of Public Works (DPW). The annual training program has included at least 40 seminar-days in Puerto Rico and 10 seminar-days in the United States Virgin Islands (USVI).

The seminar program includes technical seminars and supporting tool-related seminars. Technical seminars correspond to topics of technical nature related to transportation, such as pavement design methodologies and construction procedures, pavement evaluation and maintenance techniques, management of transportation projects, material testing and selection procedures, safety evaluation and analysis of highway facilities, traffic engineering, and development of geographic information systems.

Figure 2 shows a technical seminar offered to local transportation officials in the Laboratory of Structural Engineering in the Department of Civil Engineering and Surveying at University of Puerto Rico at Mayagüez.

FIGURE 2
TECHNICAL SEMINAR OFFERED TO LOCAL TRANSPORTATION OFFICIALS

Supporting tool-related seminars include topics that complement routine transportation-related activities such as introduction to microcomputers, introduction to spreadsheets and databases, basic management concepts, ethics for engineers, basic statistics, basic supervisory skills, tort liability, and guidelines in technical writing. During the last four years, on the average, 7,570 participant-hours (PHs) have been devoted to the four (4) focus areas established by FHWA in the Strategic Plan for LTAP Centers, namely highway safety, worker safety, infrastructure management, and workforce development (see Table 1). During the 23 years of the T_ Center, over 23,500 transportation officials of Puerto Rico and the USVI have participated in the training program.

Focus Area	Average Participant-Contact hours
1. Highway safety	1,000
2. Worker safety	475
3. Infrastructure management	4,825
4. Workforce development (management / leadership and soft skills)	1,270
Total	7,570

TABLE 1
AVERAGE DISTRIBUTION OF PARTICIPANT-CONTACT HOURS FOR CENTER SEMINARS DURING CALENDAR YEARS 2004-2008

II. El Puente Bilingual Newsletter

The T_ Center publishes a bilingual newsletter in English and Spanish entitled “El Puente” (The Bridge) that serves as a bridge of information between the Center and the local transportation officials in the western hemisphere. The current format provides information about the latest transportation engineering related technology, technical publica-

tions and audio-visual materials available at our library, and the topics and upcoming dates of the training opportunities sponsored by the T_ Center available to engineering students and local transportation officials. The newsletter also serves as a vehicle for reader response and for the continuous assessment of the Center´s tasks since stakeholders can provide comments and specific suggestions related to their training needs and requirements.

III. Technical Information Services

The T_ Center maintains a transportation-related library that provides technology transfer materials in the form of technical publications and audio-visual material to municipalities or transportation officials. The library includes over 1,900 research reports, technical magazines, transportation and highway engineering textbooks, proceedings of transportation-related conferences, and catalogues of information services that assist in the acquisition of technical information not available at the T_ Center. This library is complemented with newsletters from other LTAP Centers, and journals and other publications from the Transportation Research Board (TRB) and the Institute of Transportation Engineers (ITE), among other institutions.

The audio-visual technical library currently consists of over 500 items in VHS, CD or DVD formats (about 80% of the materials are in English and 20% in Spanish). The principal topics include administration and management, asphalt, bridges and structures, design and construction, equipment and vehicles, geotechnology, drainage, pavement maintenance, traffic operations and traffic safety.

The T_ Center also provides technical information services to municipalities as requested through its web page (www.uprm.edu/prt2). The information provided is in terms of advice, guidance, or referral to published materials, new video releases associated to transportation issues and other relevant areas associated to the built transportation infrastructure in Puerto Rico and the USVI. The web page also includes links to other web pages, newsletter articles, upcoming events and tips/checklists of interest to our local stakeholders. Telephone, letter and electronic mail are also used to handle any request. In certain cases, the requests could be used to develop a seminar topic of interest to other officials from the municipalities.

IV. Special Projects

The T_ Center participates in short-term projects of interest to engineers, managers and decision makers from the municipalities, the DTPW, and the DPW to complement its technology transfer activities. A listing of representative special projects is shown below:

- Development of transportation-related microcomputer software tools.
- Translation to Spanish of technical material of transportation-related topics including the Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects.
- Development of guidelines for the municipalities on how to prepare Request for Proposals (RFP) related to public transportation projects.
- Development of technical videos regarding the proper sampling, placing, compaction, inspection and maintenance of asphalt, concrete, and soils in road and bridge construction.
- Development of local technical guidelines for temporary traffic control (TTC) in highway work zones following the Manual on Uniform Traffic Control Devices (MUTCD) of the USDOT-FHWA.
- Participation in the USDOT-FHWA Strategic Highway Research Program (SHRP) Assessment Project regarding the documentation of successful stories associated to the implementation of safety products in highway construction zones, and the inventory of existing pavement distresses.
- Development of a special seminar based on a comprehensive literature review and survey related to American with Disabilities Act (ADA) and its legal implications.
- Identification of transportation needs of municipalities of less than 50,000 populations through periodic surveys of their transportation officials.
- Evaluation of existing infrastructure transportation facilities and evaluation of marketing methods to promote public transportation in municipalities with a population of less than 50,000.
- Planning, coordination, offering and publication of the proceedings of the 1st Transportation Research in the Americas Conference as part of the North Atlantic Association of State and Highway Transportation Officials Conference (NASTO).
- Planning, coordination, and offering of the 1st Transportation Technology Transfer Conference in Monterrey,

Mexico in coordination with the Border Technology Exchange Program (BTEP) of the FHWA.
- Collaboration with the College of Engineers and Surveyors of Puerto Rico (CIAPR) in the planning and coordination of the transportation infrastructure technical sessions of the 1st Congress of the World Federation of Engineers Organization (WFEO) held in Puerto Rico.
- Collaboration with the United States Southeastern Local Roads Conference (SERLC) officials in the planning, and coordination of the transportation infrastructure technical sessions.
- Collaboration with the Mayagüez Coalition for the Development of the Western Region of Puerto Rico, the CIAPR, the government and the private sector in the planning, coordination and offering of the 1st Infrastructure and Safety Conference.

EFFECTIVENESS OF THE CENTER'S ACTIVITIES AND SPECIAL PROJECTS

The effectiveness of the Center's activities and special projects is evaluated on a continuing basis with the evaluation forms distributed in each seminar and with the comments received from members of the Advisory Committee and the stakeholders. In addition, continuous feedback from customers not involved in our seminar program is received through the web page, newsletter and through a periodic questionnaire administered to stakeholders. Through this mechanism and following the guidelines of the Strategic Plan of the National LTAP Association, the evaluation of the effectiveness of the program is a continuous process.

Program Assessment Report (PAR) and Center Assessment Report (CAR)

The LTAP Centers collect data of each calendar year and submit this information to FHWA in two quantitative tools known as the Program Assessment Report (PAR) and the Center Assessment Report (CAR). These reports provide both FHWA and program stakeholders with an up-to-date view of the quality of the LTAP/TTAP program and its impact on the surface transportation community.

The CAR addresses specific success and challenges, general program and center management and overall program and center management. The PAR includes data of the major activities conducted by the T_ Center that are associated with the performance measures incorporated in the T_ Center's Strategic Plan.

INNOVATIVE ENGINEERING EDUCATION INITIATIVES

The T_ Center, in addition to the FHWA LTAP program, has participated in pioneering engineering education initiatives at the local and international level. Seven (7) programs associated with professional development, community service, internships and fellowships programs, and international collaborations involving students, faculty professors and the Center Directors. The education initiatives that have been administered through the T_ Center are described below.

I. UPR / MIT / Tren Urbano Professional Development Program

The University of Puerto Rico (UPR) and the Massachusetts Institute of Technology (MIT) began a professional development program in 1994 related to the planning and construction activities of the Tren Urbano (TU), the heavy rail mass transit system and largest transportation infrastructure project constructed in the San Juan Metropolitan Area (SJMA).

Undergraduate and graduate students from engineering and other disciplines learned the importance of analyzing and evaluating all aspects of a transportation project such as engineering, transportation systems, architecture, social factors, urban planning, safety, and public participation. Students were exposed to a multidisciplinary setting that promoted the interaction among professionals, exposition to the latest technologies, global impacts, ethics and professionalism, contemporary issues, and communication skills, and allowed them to apply their knowledge in mathematics, science, and engineering to conduct experiments, and to identify, formulate and solve engineering, architectural and planning problems. [3-4]

The success of the UPR/MIT/TU Professional Development Program rely on the employment of a team approach toward problem-solving between members of the academia, researchers, and the private and public sectors that make

it a true technology-sharing component of the TU. The program consisted of five elements: university courses on public transportation specifically designed for this innovative project, research projects developed by the students, summer hands-on work internships, site visits to TU construction sites and to an operating urban rail transit system, and potential post-graduation employment with TU consultants and contractors. Figure 3 shows one of the program elements; students visiting the construction site of one of the TU stations.

FIGURE 3
UPR/MIT/TU GROUP 10 STUDENTS VISITING A TREN URBANO STATION CONSTRUCTION SITE

This multi-campus engineering education initiative resulted in excess of 300 research projects were developed in this successful initiative in partnership with MIT and other supporting universities, many of which have been used by the TU operator and the government managers in their decision making process. Faculty members have also contributed in a comprehensive evaluation of the TU heavy rail project with its benefits and uncertainties [5]. Many engineering, planning and architectural students that participated in the program have been employed by Alternate Concepts Inc., the private contractor operating the rail system, by "Alternativa de Transporte Integrado (ATI)", the government office in charge of supervising the TU operation and its integration to other transportation modes, local government transportation offices, and private consultant firms.

II. UPR / PUPR / ATI Professional Development Program

The UPR / PUPR / ATI Professional Development Program have been in operation since the summer of 2004. This program involves the UPR Mayagüez and Río Piedras Campuses, the Polytechnic University of Puerto Rico (PUPR) and ATI through the Puerto Rico Highway and Transportation Authority (PRHTA). The UPRM is continuing this successful venture as the lead university through the T_ Center.

FIGURE 4
UPR/PUPR/ATI GROUP 3 EXPLORING THE PORTLAND TRANSIT SYSTEM

In this program, undergraduate and graduate students, with faculty mentorship from the three campuses, learned about the interaction among professionals and focused on the integrated operation of the TU. This program is similar to the earlier UPR/MIT/TU Program with a new emphasis on analyzing the effectiveness of the SJMA public transportation system since the TU started operations, and the many impacts the TU rail system is having on the SJMA and on its integration to other public transportation modes. Figure 4 presents one of the program elements with a group of our students visiting the Portland TRI-MET system to learn about its history and operation to transfer those experiences to the ATI and TU in Puerto Rico.

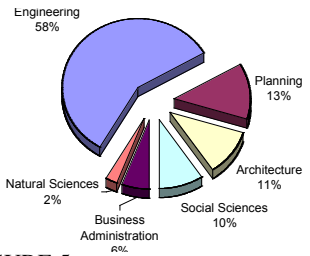

FIGURE 5
DISCIPLINES OF STUDENTS PARTICIPATING IN THE UPR/PUPR/ATI PROGRAM

Eigthy-four students representing six different disciplines and three university campuses have participated of this program during its four years. Students from different disciplines are encouraged to work in multidisciplinary teams to develop their research projects and provide an integrated solution. Figure 5 presents the distribution of disciplines of the students that have been participating in this project. Over 60 research projects have been completed as result of this initiative.

III. Dwight David Eisenhower Transportation Fellowship Program

The Dwight David Eisenhower Transportation Fellowship Program (DDETFP) was established as part of the US Legislature entitled ISTEA. [6] The objectives of the program are threefold:

1. Attract the nation's brightest minds to the field of transportation,
2. Enhance the careers of transportation professionals by encouraging them to seek advanced degrees, and
3. Retain top talent in the transportation industry.

The fellowship program helps upgrade the scope of knowledge of the entire transportation community in the

United States and encompasses all transportation modes and sponpeople interested in pursuing a graduate degree in a field of study directly related to transportation. The T_ Center has been administering fellowship program since 1994, benefiting 65 students, many of which are current leaders within the local transportation field.

The ongoing research projects are aimed in improving highway safety and reducing fatalities, analysis of crash data and human factors, crash countermeasures selection, roadway and roadside design, safety improvement programs, traffic operations, transit systems, transportation planning and environmental aspects. Figure 6 shows the research topics of the UPRM students that have participated in the program since its inception in 1994.

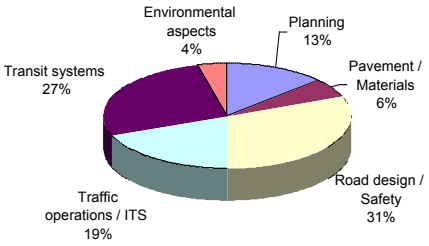

FIGURE 6
RESEARCH TOPICS OF UPRM EISENHOWER

IV. Entrepreneurial Training and Technical Assistance Program (ETTAP)

The T_ Center, with the collaboration of the Office of Small and Disadvantaged Business Utilization (OSDBU), participated in ETTAP since 1997. This program, through partnership agreements with Minority Educational Institutions (MEIs), including Hispanic-Serving Institutions (HIS) and Historically Black Colleges and Universities, combined the efforts of MEIs, government, and the private sector to focus on providing transportation-related assistance and procurement information to small, women-owned and disadvantaged business. ETTAP focused on three transportation-related areas: [7]

- Training and technical assistance on the use of and access to electronic commerce and the Internet,
- Transportation-related student internships, and
- Information dissemination and outreach activities regarding the Presidential Welfare-to-Work Initiatives to hire individuals off the welfare rolls and to support the USDOT Garrett A. Morgan Technology and Transportation Future Programs.

ETTAP provided training and development to students in K-12 levels in transportation-related fields through the use of internships and fostered interdisciplinary opportunities for students in the field of transportation. Figure 7 presents one of the interns giving a transportation-related seminar to middle-school students. The ETTAP program agreement increased the skills and understanding of technical issues and research skills of students, including students with disabilities, promoted and encouraged the participation of students with disabilities in transportation-related contracts and fostered interdisciplinary opportunities for undergraduate college students in the field of transportation.

FIGURE 7
ETTAP INTERN GIVING A TRANSPORTATION-RELATED SEMINAR TO MIDDLE-SCHOOL STUDENTS

V. Engineering Projects in Community Service (EPICS)

The T_ Center Director and the UPRM Department of Civil Engineering and Surveying, in collaboration with Purdue University, participated in the EPICS Program [1]. EPICS is an innovative program that creates partnerships between teams of undergraduate students and non-for-profit local community organizations to solve engineering-based problems in the community. During the years 2002 and 2003, engineering students worked in collaboration with students from the Department of Social Sciences, Humanities and other disciplines from the UPR Mayagüez and Aguadilla Campuses, and with the University Institute for the Development of the Communities, in community service projects in over 35 communities of the western region of Puerto Rico. Figure 8 presents an EPICS activity in one of the communities selected for the service projects.

Surveys, inspections documenting deficiencies in the built infrastructure, and coordination of social activities to improve the self-esteem of the community were conducted. Posters and technical oral presentations were made by the students to the communities and to local transportation officials, of which many of the recommendations have been implemented.

FIGURE 8
EPICS COMMUNITY SERVICE ACTIVITY

VI. UPRM/URI Summer Internship Program

Since 2004 to present, UPRM and the University of Rhode Island (URI) have participated in a Summer Exchange Internship Experience. The Summer Exchange Student Program is sponsored by the URI Transportation Center and the Dwight David Eisenhower Transportation Fellowship Program of the FHWA. Students from URI conducted research work in Mayagüez under the supervision of professors from the UPRM College of Engineering in areas associated with fiber reinforced materials, landslide-prone sites, vehicle-pedestrian crashes/highway safety, improvement in text and video information in variable message signs through simulation and geotechnical engineering laboratory characterizations. The exchange program provides students with a new arena to learn from other faculty researchers, different cultures and traditions, and help them to become independent and to develop other soft skills that are required to become a successful professional in engineering and transportation-related disciplines.

VII. International Collaborations in Engineering Education

The T_ Center has collaborated with international organizations and governments to provide information on the FHWA Transportation Technology Transfer Program and the Puerto Rico public transportation system, including the characteristics of the "Público" system and the TU. Several of these international collaborations are:

- The "Congreso Panamericano de Carreteras" (COPACA) in 1988 requested several presentations in Buenos Aires, Argentina, about the Rural Technical Assistance Program (RTAP) and specifically about the tasks, organizations and accomplishments of our Center to consider extending the transportation technology transfer concept throughout Latin America.
- COPACA and the FHWA in 1988 requested the assistance of the Center's Directors in the Founder's Conference of the Pan-American Institute of Highways that was held in Phoenix, Arizona. The participation of the Directors, due to their bilingual capabilities, was instrumental in the development of formal documents that led to the creation of the PIH that extended the RTAP concept to countries in the Caribbean and South America.
- The USDOT Federal Transit Administration (FTA) in 1990 requested the assistance of the Center's Directors to provide technical information on the Puerto Rico "Público" system to the government of South Africa since the kombi system was experienced major operational problems. Presentations were made in South Africa to government officials from their Department of Transportation and professors from the University of Pretoria.
- Since 1996, due to involvement of the Center's Directors in the UPR/MIT/TU and UPR/PUPR/ATI Professional Development Programs, the "Asociación Latino Americana de Metros y Subterráneos" (ALAMYS) has invited professors to participate in its Annual Conference held in Latin America cities. Presentations have been made regarding the SJMA public transportation system that led ALAMYS to accept the Puerto Rico Highway and Transportation Authority (PRHTA) as a full member of this prestigious organization.

ENGINEERING EDUCATION AT THE LOCAL LEVEL

The Center has collaborated with many local partners that include the College of Engineers and Surveyors of Puerto Rico (CIAPR), the Office of Municipal Affairs (OCAM) of the Government of Puerto Rico and the Office of the Comptroller of Puerto Rico. The Association of General Contractors (AGC) of Puerto Rico and other construction-related companies and suppliers of safety devices and computer assisted design products have also contributed in providing instructors to our seminars and workshops. Figures 9 and 10 shows the instance in which Collaborative Agreements were signed by the T_ Center Director and the President of the CIAPR-Mayagüez Chapter and the Commisioner of OCAM, respectively. Figure 10, also shows the Majors of four municipalities from the Western Region of Puerto Rico, namely Hormigueros, Mayagüez, San Sebastián and Aguada that participated in this historical moment.

FIGURE 9
SIGNING OF THE COLLABORATIVE AGREEMENT BETWEEN THE T_ CENTER AND THE CIAPR

Similar training and technology transfer initiatives with the Office of the Comptroller of Puerto Rico, and with the attendance of the Majors of the municipalities, their Department of Public Works and Planning Office Directors have also been conducted during the last seven years. In this initiative the Comptroller staff train the participants on the laws and regulations associated with the best practices of managing public administration funds

and the Center Instructors complements with seminars associated with effective engineering and management skills for transportation and public works. The Center also uses this forum to distribute questionnaire and to conduct surveys to identify the training needs of local transportation officials and to receive real-time feedback on how we are addressing their engineering and training needs.

FIGURE 10
SIGNING OF THE COLLABORATIVE AGREEMENT BETWEEN THE T_ CENTER AND OCAM

FUTURE CHALLENGES IN ENGINEERING EDUCATION

Engineering education, training, technology transfer and professional development are all about people. Those that train have the responsibility and play a vital role in the preparation of the transportation workforce and in motivating them to do a job of excellence. The T_ Center has played a key role in the development of transportation professionals, providing continuing education to local transportation officials and in providing a bridge with North, Central, and South America and the Caribbean in sharing and adapting the latest technology in a bilingual setting using the university as the education backbone of the system.

A new generation of transportation engineering professionals address the challenges that will emerge from the recently enacted federal legislation entitled SAFETEA-LU (Safe, Accountable, Flexible, Efficient, Transportation Equity Act – A Legacy for Users), PL 109-59. The development of innovative research projects using highly competent interdisciplinary, multi-campus, and bilingual professionals that address local and national transportation and infrastructure issues, public transportation, and highway safety to all users is one of the T_ Center's priorities in the UPR/PUPR/ATI component. The evolution and continuously changing Center´s activities have benefitted from the feedback from its stakeholders, the assessment of its tasks through informal and formal methods, as described in earlier sections, and from its interaction with local government agencies and collaborators from professional engineering organizations. The T_ Center will continue to create new and strengthen the existing collaborations with professional organizations and student organizations to promote engineering education and transportation training. The Center has fostered the relationship with student chapters of professional organizations, such as the Institute of Transportation Engineers (ITE) at UPRM, which its student members have participated actively from several of the Center activities.

The T_ Center will continue to be the principal component in the School of Engineering at the University of Puerto Rico at Mayagüez in its active role in educating engineers, surveyors, and other transportation-related professionals that serve municipalities and local transportation officials with the latest technology to contribute to the knowledge-based in transportation in Puerto Rico, the Caribbean and the western hemisphere.

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References

01. B. Colucci, and F. Luyanda, "20th Anniversary, Puerto Rico Transportation Technology Transfer Center", Internal Report, University of Puerto Rico at Mayagüez, April 2006.
02. LTAP. "2006 Annual Overview". National LTAP/TTAP website. http://www.ltapt2.org, last accessed: November

25, 2007.
03. B. Colucci, J. Izquierdo, L. Mercado, F. Salvucci, and N. Wilson. “A New Model for Applied University Research and Professional Development: The Tren Urbano Program”. Proceedings of the 80th Transportation Research Board Annual Meeting, Washington, D.C., January 2001.
04. B. Colucci, and J. Gutiérrez. “Iniciativa UPR/MIT/TU: Un Nuevo Enfoque para el Desarrollo Profesional”. Congreso Latinoamericano de Transporte Colectivo, Caracas, Venezuela, 1999.
05. F. Luyanda, Public Transportation in the New Millennium: The Case of Puerto Rico and the Tren Urbano, Eliyan Publishers, Mayagüez, Puerto Rico, 2001.
06. B. Colucci, A. González, L. Mercado, K. Kruckemeyer, and N. Wilson. “Leadership and Professional for Public Transportation”. Proceedings of the First International Conference on Urban Public Transportation Systems, Implementing Efficient Urban Transit Systems and Enhancing Transit Usage, American Society of Civil Engineers, Miami, Florida, March 21-25, 1999, pp 465-476.
07. B. Colucci, A. Figueroa, and L. Garay, “Educación para el Desarrollo de Ingenieros con Visión Empresarial”. Proceedings of the XVIII Congreso Panamericano de Ingeniería Mecánica, Eléctrica, Industrial y Ramas Afines (COPIMERA), Quito, Ecuador, November 26-29, 2001.

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Alberto Figueroa received his B.S.C.E. and M.S.C.E. from the University of Puerto Rico at Mayagüez in 1997 and 1999, respectively. He received his Ph.D. degree in Transportation Engineering from Purdue University in 2005. Since 1999, he has been a faculty member in the Department of Civil Engineering of the University of Puerto Rico at Mayagüez. In 2007 was appointed Deputy Director of the Transportation Technology Transfer Center. He currently coordinates the Dwight David Eisenhower Fellowship Program and is a faculty mentor in the UPR/MIT/TU and UPR/PUPR/ATI Professional Development Programs. He is a registered Professional Engineer in Puerto Rico and Member of the Institute of Transportation Engineers (ITE).