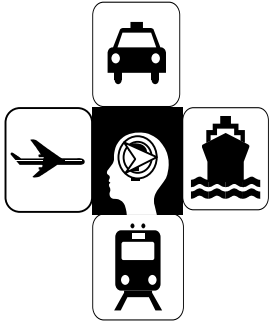


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Tech Brief

E-Station for Newark

FHWA-NJ-2002-009

July 2002

What is an e-station?

The e-station is, first and foremost, a bus station. It is a new kind of bus station made up of different components. It is intended to provide enclosed, secure, shelters to increase the safety and comfort of waiting for the bus. These shelters are connected to an intelligent transportation system, which shows the location of the bus and displays the bus's estimated time of arrival. The e-station is also a portal to the internet, giving poor urban residents, who do not have computers at home or who cannot afford internet access, connections to information, services and resources. In this way, e-stations will help bridge the digital divide. E-stations follow the model of traditional train stations, offering customers a variety of services in addition to comfortable and predictable access to transit. They will enhance both actual and virtual mobility.

Who are the founders and who is the client?

The e-station is funded by the New Jersey Department of Transportation (NJDOT), The Casino Reinvestment Development Authority (CRDA), and the National Center for Transportation and Industrial Productivity (NCTIP). The client for the e-station is NJ Transit and the City of Newark, specifically the Business Development and Transportation Engineering Departments, and several community-based organizations.

Why are e-stations needed?

- e-stations make the use of computers and the Internet as visible, and as easily available as possible to the residents. One can see right into an e-station from the street; one can enter and try a computer without making an appointment or discovering the organization's schedule. One can check employment opportunities and reply to them with a resume on a regular basis. In this way, the e-station is consistent with federally funded efforts to make job and social service information available on the Internet. Also, one can begin gradually: first using the touch screen format of computers for purchasing bus tickets and then moving on to more involved computer use.
- By virtue of its location and use as a bus station, the e-station incorporates computers and Internet access into people's daily routine, combining them with other tasks and activities (such as bus travel, using the ATM machine, shopping at adjacent stores).
- The fully developed e-station will allow residents to purchase goods online and, moreover, to have them delivered to the e-station. At present, Newark neighborhoods lack commercial facilities, shopping on-line addresses a current need. Delivery to the e-station solves the problem of the reluctance of private companies to deliver to some Newark neighborhoods and can increase convenience for those who are not home to receive packages.

RESEARCH APPROACH

The idea of e-stations is to combine elements that are currently available and in use in some places but that have not been brought together in this manner before. How exactly this could be done, what kinds of additional issues have to be considered and resolved, what kind of building is required, and where the first one could be located all required research, analysis and design.

Who developed it and who sponsored it?

University based research at the New Jersey Institute of Technology centered around faculty and students of:

- The School of Architecture.
- The Department of Infrastructure Planning.
- The Department of Biometrics.
- The Departments of Computer Science and Transportation Engineering.
- The School of Management.

The project integrated several interdisciplinary design studios. The first, in Infrastructure Planning, developed a web-based document that defined a concept. Led by faculty from the School of Management, the studio convened a focus group to then develop a program. Afterwards, two Architectural Design Studios developed prototypes.

The work of these studios was reviewed by architects, engineers, community developers and researchers. An operations and management plan was developed in the School of Management. Finally, prototypes were cost-analyzed by the construction management partner of the project.

Infrastructure: Connecting Four Networks

- The e-station is at the epicenter of four larger orders or networks. The e-station is proposed for inner city communities in Newark, itself an urban network.
- Many community residents are important clients of the transportation network, depending substantially on bus transportation.
- In these same communities, residents have limited access to the information network; they are on the far side of the so-called "digital divide" and many have no computer or Internet access.
- Residents' connection to a social network is strained. They are without direct access to commercial and social amenities: supermarkets, pharmacies, doctors, jobs, and counseling.



View of north side of Springfield Avenue from project site

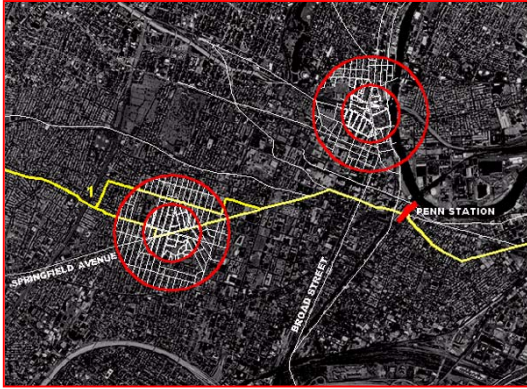
The Urban Network

The e-station is proposed for Newark, part of the greater New York metropolitan area. The development of the e-station complements the city's recent revival. Violent unrest in the late 1960's led to decades of decline, with a third of its population departing. But beginning in the 1990's, numerous projects have commenced. Beyond the downtown area, there has been significant growth in the residential sector. But while housing opportunities have improved, commercial amenities have lagged behind.

Over 60 % of Newark's residents depend on local bus service for their transportation. While bus service itself is adequate, the experience of waiting for the bus is seriously deficient. There are often no bus shelters to give protection from inclement weather or a place to sit. There is no indication when buses will arrive and waiting on the street can be unsafe. Improving the predictability, comfort and safety of waiting is an important aspect of improving public transit.

The e-station was studied at two contrasting locations: one downtown at Broad Street Station the other in a residential neighborhood along Springfield Avenue. The train station location was ultimately ruled out, as it would not qualify for development funds from the Casino Reinvestment Development Authority.

The Springfield Avenue site qualifies; 34,000 passengers on five bus lines pass this location every day. Students collated passenger ridership and did field surveys during peak periods. Not surprisingly, 60% of embarking passengers were outbound, as inner city residents increasingly seek employment in suburban locations. The site is in a residential part of the city, home to several well-organized, community-based organizations that surround a park designed by Frederick Law Olmsted. The site chosen for construction of the first e-station is Springfield Avenue and South 10th Street.



Bus Route #70



Bus Route #42



Bus Route #25

BUS	TRIPS	RIDERS
#1	286	16,337
#5	86	2,760
#5	301	14,615
#42	18	352
#70	101	6,583

This site receives significant bus traffic: it is adjacent to or very close to four bus lines (Numbers 1, 5, 25, and 42).

One of these organizations CREST CDC, is seeking to develop a 50,000 square foot supermarket on Springfield Avenue.

The Transportation Network

Newark is challenged by growing traffic congestion for which the deployment of an Intelligent Transportation System (ITS) will be critical in resolving. ITS integrates computer and telecommunication technologies to enhance transportation networks. At the e-station, users will be able to make informed choices based on real time bus locations.

There are three ITS technologies that could be combined to provide real time bus locations to the e-station.

- The first of these technologies is the existing Automated Vehicle Location (AVL) System that was implemented in Newark in 1994. It uses the city's light poles which equipped with a receiving device, can read transmitters on buses at up to 600 feet. Because the system cannot integrate with newer software, it is currently only used to locate buses in emergencies.
- The second technology is the EZ-pass system: an existing regionally deployed, and field-tested ITS technology that can be adapted to determine the location of the bus. Antennas at fixed locations along each route will read electronic tags installed on the bus. However, obstacles like parked vehicles could block the signal.
- Third is the Global Positioning Systems (GPS), the backbone of any ITS system. GPS tracks signals from satellites and a centralized home location to establish the location of vehicles to an accuracy of fifteen feet. But the signal can be unreliable when interrupted by tall buildings. Ultimately a cost-effective ITS system can be deployed for the purposes of an e-station prototype in Newark by combining GPS with either EZ-pass or the existing AVL system.

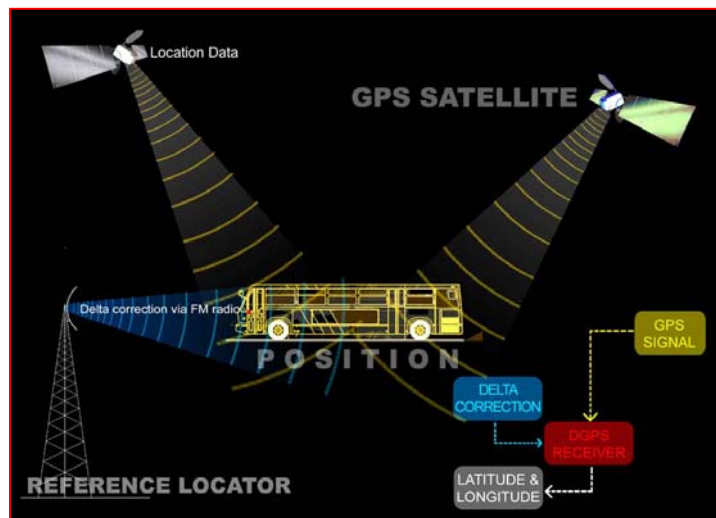


Diagram of GPS enabled bus

The Information Network

Another ITS technology is the kiosk. Kiosks provide real-time travel information, allowing web-based access to maps, routes and transportation schedules. Similar to the Automated Teller Machine (ATM), kiosks are now common at large transportation facilities. According to intelligent transportation professionals, ticket vending machines

will merge with kiosks within ten years and be as revolutionary for public transportation as the ATM has been for banking.



Kiosks will employ touch screen technology, which since the advent of the ATM has evolved as an easy-to-use, intuitive method of interacting with computers.

A Flat monitor touch screen

The impending adoption of Smart Card technology will only increase the functions available at kiosks. Equipped with an electronic chip, Smart Cards are read through a radio frequency transmission when the card is passed in front of a receiver. Smart Card technologies reduce labor-intensive cash handling costs, permit sophisticated fare pricing, allow for automated passenger counts, and link different transportation networks.



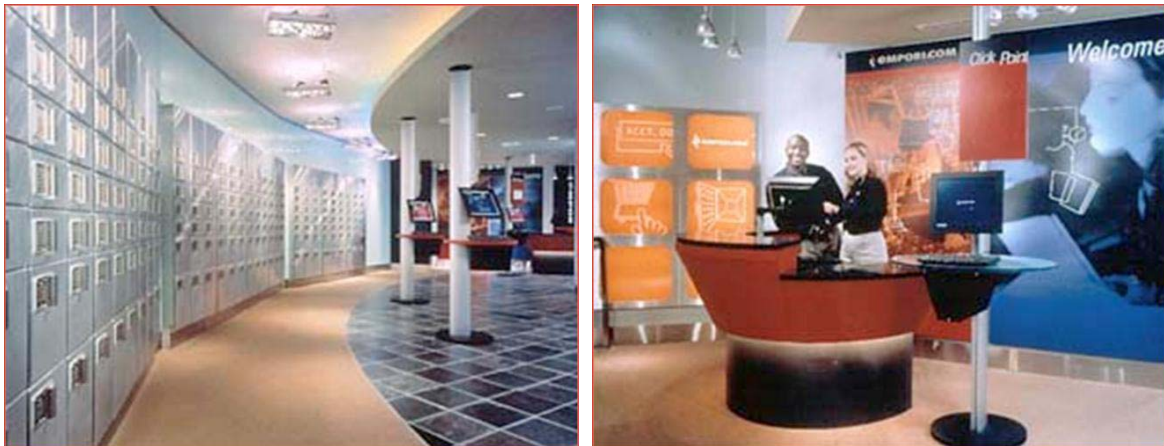
While NJ Transit's deployment of a Smart Card is years away, the technology is becoming widely used and integrated within credit, bank and ID cards. The e-station will integrate Smart Card technology allowing the users: keyless access to the building, to the internet, to telecom services, to social services, to bus tickets, retail purchases, and ATM transactions.

The Social Network

The e-station is conceived to bridge inequity in the information network, inequity known as the digital divide. In 2001, over half the U.S. population was using the internet at home but only 30 percent of Hispanics and 33 percent of African Americans were doing so. The e-station will bridge that digital divide gradually; first by using kiosks, later with computers in a separate, secure location. As it is almost impossible to secure employment today without a phone number, the e-station will also provide telephone, fax and e-mail. Once initiated to the internet, a user at an e-station will be able to participate

in the world of e-commerce, the fastest growing commercial use on the internet with transactions last year (2002) exceeding 37 billion dollars.

Inner city e-commerce is inhibited as Fed Ex and UPS do not deliver packages to certain poor neighborhoods citing security concerns. To redress this, users will be able to receive goods purchased online at an e-commerce depot within the e-station in a manner similar to that of enterprises as empori.com. Imagine having your milk and bread waiting when you step off the bus.



www.empori.com

In Newark, the e-station will incorporate a One-Stop Career Center, federally funded through the workforce New Jersey Public Information Network. One Stop is meant to develop local workforces in populations with barriers to employment. Each is staffed with a state-certified vocational counselor and maintains networked computers with internet connections. Connected together electronically, centers are typically in decentralized locations. But the One Stop Centers operating in Newark today are not in highly visible locations, on the upper story of an office building or buried in a community center's basement. As a result, they have not experienced the usage expected.

Locating a One Stop Center at the e-station would make the One Stop services very public, easily accessible and convenient.

The e-station will seek support from CTCNET as a community technology center. CTCNET is a National Science Foundation funded organization that encourages access to computer technology and support center nationwide.



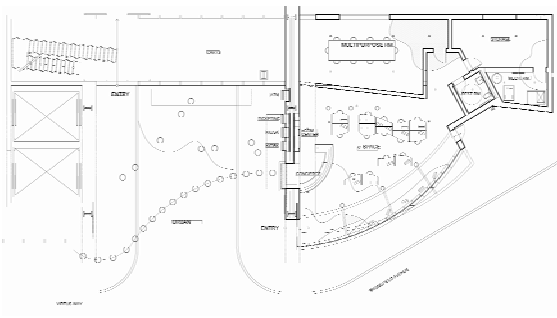
FINDINGS

Architectural Program and Design

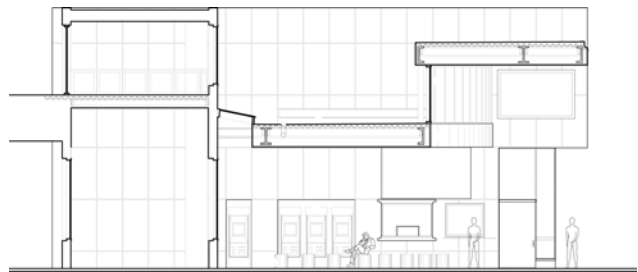
Using the programmatic information developed students in two architecture studios designed prototypes of the e-station for the supermarket site. Because the supermarket was still in planning stages, students were allowed to locate the e-station anywhere along the Springfield Avenue frontage. They were asked to develop prototypes that were semi-attached so that construction could precede, if necessary, that of the supermarket. Students were required to propose the supermarket entry and vertical circulation in their designs. Designs were developed to a 50% Design Development Grade.

PROTOTYPES

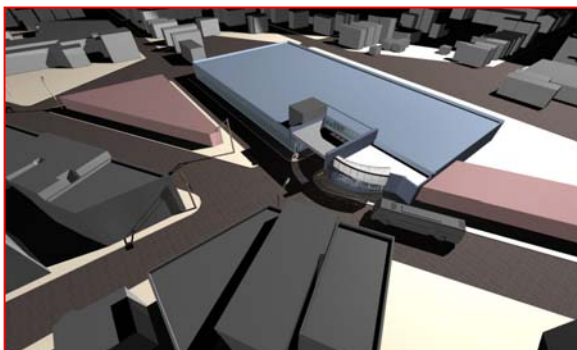
Eric Miller, Professor Sollohub



Floor Plan

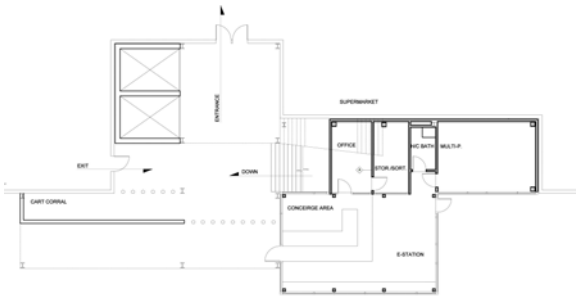


Cross Section

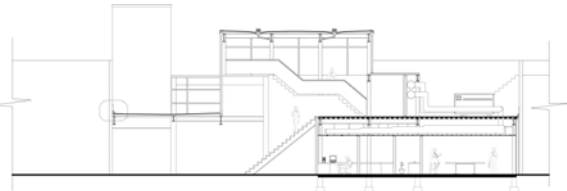


Exterior View, Computer Rendering

Joseph Delucia, Professor Sollohub



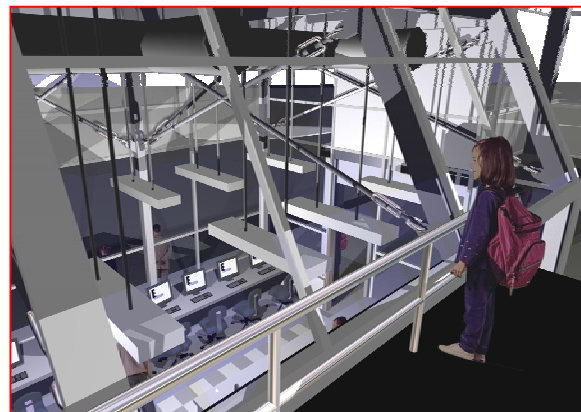
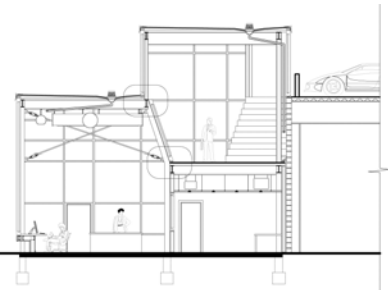
Floor Plan



Cross Sections



View from Springfield Avenue, Computer Rendering



Interior Views, Computer Rendering

Operation and Management

With the research presented in the web-based document and after meetings with the project team and additional research of their own, three students in the Small Business Institute in the NJIT School of Management developed a preliminary business plan for the e-station.

Business Plan

As envisioned in the business plan developed by management students, the e-station will operate as a public-private partnership. Under this plan, the e-station would be owned by CREST CDC, a non-profit community-based organization. This organization would lease space to one or more businesses occupying the e-station. The business component will act as a catalyst for development, eventually making the e-station self-sustainable and profitable through a steady revenue stream. Public funding for operations would come through the one stop program and other sources identified and solicited by CTCNET.



RECOMMENDATIONS

The goal of this research was to conceptually design and assess feasibility of the e-station for a given site in anticipation of supplemental funding for design and construction. As a “new technology” project, the e-stations prospects has been buffeted by the collapse of the internet economy, and in being reliant upon public funding, its potential has been affected by the huge deficits that that both the federal and local governments in the US find themselves with today. The \$240,000 designated by CRDA to develop the e-station is currently frozen due to statewide budget constraints. The

intended private operator that would have worked in partnership with CREST, has closed its business.

On a positive note, CREST recently received a \$400,000 business development grant and has begun to develop the supermarket

The recommendations to be made at the conclusion of this study are:

- Maintain the potential for the e-station by continuing to seek support from public and private sources.
- Maintain contact with umbrella organizations such as CTCNET and One Stop.
- Monitor NJ Transit's deployment of an AVL system for mass transit and recommend development of an e-station at inner city locations if such a system is developed.
- Monitor the development of Bus Rapid Transit nationwide and lobby for its development in New Jersey.
- Continue to lobby local government to develop the e-station concept.

Additional support will begin a second design phase in which a student team, using the prototypes as departure points, will develop a design up to 50 percent construction documents. A private architectural firm will assist faculty during the student phase, then complete the design and administer construction. The construction manager, will contract out the building of the first e-station, after which CREST or another community-based organization will operate and maintain it along with their private, for-profit, partners. At the appropriate time, marketing students in the School of Management will further develop an operating and marketing plan. The specific legal arrangements regarding responsibilities, assets and liabilities between the development corporation, the private entrepreneur/operator and the One-Stop program will have to be finalized. CTCNET has a program that assists in these arrangements. CTCNET also has a program to train staff. This will lead to successful, sustainable operation of the first e-station.

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A final report is available online at <http://www.state.nj.us/transportation/refdata/research/>

If you would like a copy of the full report, please FAX the NJDOT, Division of Research and Technology, Technology Transfer Group at (609) 530-3722 or send an e-mail to Research.Bureau@dot.state.nj.us and ask for:

Report Title
 NJDOT Research Report No: FHWA-NJ-2002-00X