PSRC Transit Access Assessment
Summary Findings of Literature and Best Practices Review
12/12/2014

Overview

PSRC staff conducted a review of existing research literature and best practices to identify the characteristics that influence how people get to transit and particularly major sites of transit service. This review revealed that many factors are associated with improvements in transit access and therefore transit ridership. However, a systematic methodology is needed to develop in order to minimize "cross-effects" of interrelated factors (e.g., benefits of mixed land-uses are greater in compact areas than dispersed areas) to evaluate individual effects more accurately. This literature review summary will inform PSRC's transit access assessment and contribute to an improved understanding of the factors associated with good transit access. The following key factors emerged from the review:

Transit service characteristics

Efficient route planning and scheduling are found to play a big role in transit access decisions. In general, both regular transit users and commuters prefer reliable and comfortable service, and fast travel times. Moreover, higher frequency (including high frequency services during peak and off-peak hours) resulted in higher service effectiveness in some studies (Currie et al., 2010).

Urban form features

Urban form features such as mixed-use development, high population densities in station catchment areas, and high employment density show a positive impact on potential increases in transit ridership. Indeed, urban form is the subject of most of the research and case studies analyzed here. In particular, land use patterns (e.g., development density and land-use mix) and street connectivity (e.g., directness of routing, block sizes, and sidewalk continuity) are associated with increased ridership. However, some studies noted that dense, mixed-use development that is not connected to the greater built environment may produce only modest regional travel benefits.

Bicycle/pedestrian connections

Several studies show that there are many factors other than distance to a station that affect the decision on whether to walk or bike, including bicycle infrastructures (e.g., bike racks, bike paths), pedestrian-friendly environment (e.g., bus stops, sidewalks, shelter, safety), and individual characteristics (e.g., car ownership, age). Only one study, however, found programs and campaigns that promote walking and biking play an important role in increasing walk and bike access to transit.

Proximity

The likelihood of transit use is strongly related to the distance a rider must travel to reach transit. This factor was typically measured through bus stop density, distance to the nearest station, and travel time. In other words, shorter distances from transit stations and faster travel times are seen to result in have an increased propensity to use overall public transit service, including non-motorized access (SDOT, n.d.; Hess et al, 2009; and Houston et al., 2014).

Parking supply

Since not all riders live within walking distance of major sites of transit service, many transit systems rely heavily on park-and-ride facilities to support station access. Some studies found boarding levels increase with the availability of parking and one study, conducted in Chicago, Dallas, and Atlanta, showed that supply of parking across multiple park and rides was the most significant variable that increases transit ridership (Ozbil et al., 2009). The success of these facilities, however, is determined by many factors, including parking availability, ease of other access modes, and area characteristics.

Bus connectivity

Some transit survey analyzed in literature shows that feeder bus service to- and from transit centers (or stations) have major benefits to transit ridership. Creating convenient connections between modes (e.g. light rail-to-bus) is emphasized in a large body of best practices.

Urban design features

Only a few studies identified urban design features, such as sidewalk design, street spacing, and street dimension, as significant factors to attract transit riders, especially those that walk to station (Cevero, 2001; TRB, 2012; and Ewing and Cevero 2013). Part of the reason for this lack of research may be with the difficulty of considering qualitative features (e.g., landscaping, building orientation, and other micro features), compared to macro geographic features, such as the level of land-use mix or population density.

Research gaps

Lack of studies on ferry transit

There is considerable research on bus and rail transit systems, but very little on ferry transit. Studies on ferry transit could help develop effective ridership plans and other efforts to make it easier for people to access ferry services.

Lack of a standardized methodology

While the literature helps to identify factors associated with transit ridership, it is difficult to judge the validity and reliability of study results. In other words, it is difficult to generalize across studies. Each study used different (or unique) methodologies to explore relationships, and the variables considered (and grouped) were not consistent. For instance, in spite of a large amount of studies on land use pattern and density factors on transit use, no clear conclusions emerge on the relationships between urban form and ridership. A limitation of these studies is the difficulty to develop well-specified statistical models that allow researchers to accurately evaluate the individual effect of urban form features. Part of the reason is due to cross-effects between density, land-use mix, and urban form. Fairly compact neighborhoods tend to have more varied land uses, on average shorter block lengths with more grid-like street patterns. Thus, the exact effect of urban form on transit access remains unclear. Because of this variability, it is difficult to determine the relative impact of each key factor.

Lack of studies on lower cost measures

A number of studies reveal that urban form, parking, and route scheduling measures will increase transit ridership. However, these solutions require relatively higher cost solutions compared to other strategies. For example, while there is much research on the effectiveness of park and rides, there is less focus on kiss-and-ride or walk-and-ride services. Moreover, only a few studies evaluate the effectiveness of programs or campaigns that encourage non-motorized transit access.

Table 1. Summary of Transit Access Literature/Best Practices Review

#	Author	Year	Area	Title	Methodology	Factor	Mode of Transit
1	Duncan et al. (Charlotte, NC)	2014	Urban	**Is the provision of park-and-ride facilities at light rail stations an effective approach to reducing vehicle kilometers traveled in a US context?**	Survey (Scenario Assumptions)	Park and ride facilities	Light rail
2	Kim et al. (St. Louis, MN)	2007	Urban	**Analysis of light rail rider travel behavior: Impacts of individual, built environment, and crime characteristics on transit access**	Survey	Socio-demographic characteristics (full-time student status, higher income) of transit riders, trips made during the evening, safety, bus connectivity, and private vehicle availability	Light rail
3	Houston et al. (Los Angeles, CA)	2014	Urban	**Can compact rail transit corridors transform the automobile city? Planning for more sustainable travel in Los Angeles**	Survey and built environment measures	Distance to rail transit station	Light rail
4	Ewing and Cevero	2013	Overall	**Travel and the Built Environment: A Synthesis**	Extensive literature survey	Land use pattern (density, mixed use), transportation networks (street connectivity, directness of routing, block size, and sidewalk continuity), urban design features (building orientation, landscaping, ped amenities, and other micro features), and composite transit- or ped- oriented design indices	Overall
5	Cevero (Bay Area, SF and Montgomery County, Maryland)	2001	Urban	**Walk-and-Ride: Factors Influencing Pedestrian Access to Transit**	Case Study	Land use pattern (mixed use) and urban design (sidewalk and street dimension)	Overall
6	Cevero (Bay Area, SF)	2012	Urban	**Bike-and-Ride: Build It and They Will Come (working paper)**	Case Study	On-site (protected bike parking racks) and off-site (bike-paths, bike boulevards) bicycle infrastructures	Rail
7	Engel-Yan (Toronto, Canada)	2013	Suburban	**Strategic Station Access Planning for Commuter Rail: Balancing Park and Ride with Other Modes**	Case Study	Station access/egress (parking, directness of routes, and conditions for walk access)	Bus/ Commuter rail
8	Center for Urban Transportation Research, University of South Florida	2009	–	**Best Practices in Transit Service Planning [Final Report]**	Best Practices	Efficient route planning and scheduling	Bus
9	Seattle Department of Transportation, WA	n.d.	Urban	**7 BEST PRACTICES - Bicycle Access to Transit**	Best Practices	Improved bike amenities (bike paths, signage, bike racks) and programs/ campaigns that promote biking	Bus/Light Rail
10	Seattle Department of Transportation, WA	n.d.	Urban	**7 BEST PRACTICES - Pedestrian Access to Transit**	Best Practices	Pedestrian-friendly environment (bus stops, sidewalks, shelter), route efficiency, accessibility, and safety/comfort improvements	Bus/Light Rail
11	Ozbil et al. (Chicago, Dallas, and Atlanta)	2009	–	**The Effects of Street Configuration on Transit Ridership**	GIS/Data Analysis	Population densities within walkable rings around station, park and ride facilities, availability of feederbus services, service potential (number of intersecting rail routes at each station), and street connectivity	Bus/Train
12	Hess et al. (San Jose, California and Buffalo, NY)	2009	Suburban	**Access to Public Transit and Its Influence on Ridership for Older Adults in Two U.S. Cities**	Survey	Reduced-fare programs, additional bus stops, expanded use of flow-floor vehicles, shuttle access, socio-demographic characteristics (male, non-white, low income), and walking distance between home and station	Bus/Train
13	Krizek and El-Geneidy (Twin Cities, MN)	2007	Urban	**Segmenting Preferences and Habits of Transit Users and Non-Users**	Survey	Service frequency, access/egress, time/cost, and the number of potential users along a route	Light Rail
14	Currie et al.	2011	–	**Exploring the drivers of light rail ridership: an empirical route level analysis of selected Australian, North American and European systems**	Multiple-regression Analysis	Service level, service frequency, being in Europe*, employment density, integrated ticketing, and track segregation	Light rail
15	Chakour and Eluru (Montreal, Canada)	2014	Urban/ Suburban	**Analyzing commuter train user behavior: a decision framework for access mode and station choice**	Survey	Travel time, parking availability, and train frequency	Train
16	Transportation Research Board of the National Academies	2012	–	**Guidelines for Providing Access to Public Transportation Stations**	Literature Review	Land use, street spacing, and development density	Overall