

INCREASING BUS TRANSIT RIDERSHIP THROUGH TECHNOLOGY AND AESTHETIC INNOVATIONS

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IMPROVING BUS TRANSIT RIDERSHIP THROUGH TECHNOLOGY AND AESTHETIC INNOVATIONS

Bus transit has faced a rocky road since the introduction of the private automobile. As cars have become more and more affordable and destinations become more and more spread out, the desirability of bus transit reduced as it constantly lost out to the competitiveness regarding privacy, time, and trendiness that the private automobile offered to its owners. However, as gas prices begin to rise once again, and as land becomes more expensive and less available for the construction of heavy and light rail projects, bus transit is poised to take back control over city transit travel. In fact, in many instances, bus transit is better suited to handle the migration and travel trends that our get-up-and-go society has come to embrace.

This paper examines various technological innovations that will enable bus transit to attract ridership on its systems and services without reducing farebox revenues. The paper begins by portraying why busses are poised to handle the growth of the American population and the trends of American migration better than other transit modes. Next we provide the historical downward trend that bus transit has experienced and its current status as a modal option today. We then discuss the myths and untruths that have abetted bus transit's popularity and usage and provide a number of research findings to help debunk these myths. Given these issues, a number of technological and aesthetic innovations are presented that will help attract ridership to bus transit from a wide range of socioeconomic levels that will enable transit agencies to increase ridership without reducing fares and revenues. We then take these innovations and rank them using a number of criteria such as cost and effectiveness in order to determine which projects are more desirable and to formulate a possible best practices approach to improving bus transit ridership. Finally, we discuss a number of approaches and determine how these innovations can be applied to the Metropolitan Atlanta Rapid Transit Authority's (MARTA) bus transit system to improve its reputation and ridership statistics.

With so many transit agencies often resorting to reducing fares or creating discounted fare programs to attract riders, they must also try and find innovative ways to improve their ridership counts without hurting their bottom line in an industry already prone to subsidization and budget shortfalls. Encouraging ridership through innovation and technology may be just the approach to attract the demographics that are on the brink of using transit ridership such as the young urban professional who simply need to be made aware of bus transit offerings and have them simply intrigued by bus service through technology and aesthetic enhancements.

WHY BUSES?

The bus has continuously taken the backseat as a modal vehicle choice with so many transit planners focusing on light rail, street car, and bus rapid transit for future transit projects. However, this cannot be blamed solely on the choices made by transit planners as transit riders and commuters often overlook the bus as a valid transit option, which has contributed to the movement away from busses as a modal choice for future projects and/or expansion. As Weitz (2008) adds, “Numerous cities have cut back on or even eliminated most public transit and others have shifted tax dollars away from bus-based systems to light rail systems, which typically benefit far smaller numbers of mostly white, middle-class, and suburban dwellers.” These biases towards the more popular and trendier modal vehicles will lead to the obsolescence of the bus and ultimately to its demise. Ironically, however, busses and their accompanying infrastructure may be better suited for the issues that accompany transit projects and may be the more practical and efficient vehicle and modal choice for many upcoming and future projects in American cities.

With American migration and settlement patterns being extremely erratic and fluid, the bus is poised to better provide transit in these scenarios over rail and bus rapid transit. The Census Bureau calculated that 35.2 million Americans or 11.9 percent of the population moved residences in 2008

(Roberts 2009). The migration of the American public is largely focused upon suburban locations where new developments are being built, where it is safer, where taxes are lower, where schools are better, and where jobs are located (Sullivan 2009). With this, migration has become very volatile leading a town or neighborhood to flourish one day and face a mass exodus the next due to these various concerns. Both rail and bus rapid transit require an extensive amount of land and right-of-ways in order to construct the dedicated guideways and stations needed to create even the smallest of transit systems of this type. Requiring less capital and infrastructure to serve commuters and residents, busses are better equipped to handle the wavering trends of American migration patterns. There is a permanence with rail and bus rapid transit infrastructure that busses simply do not possess. Busses are better able to move and adapt to the current trends affecting American migration simply by rerouting busses and relocating bus stops to where the public is moving.

Density also plays an issue when considering the type of transit system to employ. Between 1950 and 1990, the amount of urbanized land in the United States increased by 245 percent while the urban population increased by only 92 percent. The “footprint of the typical metropolitan area increased more rapidly than its population, as a result, urban density decreased (Sullivan 2009). Roberts (2009) adds, “Suburbs gained 2.2 million movers while major cities lost 2 million [in 2008].” With the trend of suburban sprawl continuing in many metropolitan areas across the country, the bus is still pegged to better serve the transit needs of these communities over rail. With many areas of cities and suburbs thinning in population, the necessary density to support successful rail operations will dwindle. As seen in Table 1, the necessary densities to support various mass transit systems lean towards bus system networks to adequately provide transit in this seemingly unending trend of suburban and urban sprawl. Busses will therefore be able to handle these population shifts simply by increasing or decreasing bus service frequency, simply shutting down or rerouting routes, and uprooting

infrastructure (i.e. bus shelters, bus stops) to reflect the changes in demand and density of the areas it serves which rail simply has the inability to efficiently accomplish.

Mode	Built-Up Density: People per Acre	Residential Density: People per Acre
One Bus per Hour	52	74
Two Buses per Hour	77	109
Light Rail	91	131
Heavy Rail	124	175

Table 1: Suggested Minimum Densities to Support Transit Source: Natural Resources Defense Council

Fiscal spending has become a major issue in the latter half of the first decade of the 2000s. With state and local government spending being so closely watched, transit spending should be focused on modes with the lowest capital and operating costs. Fortunately, bus transit has lower capital and operating costs compared to both rail and bus rapid transit. First and foremost, as mentioned earlier, the capital cost involved in projects of this magnitude is a concern for any transit mode. The cost required to purchase vehicles, construct stations, create signage, etc. is a serious investment to undertake. However, for rail and bus rapid transit the capital costs required to obtain right-of-ways and construct fixed and dedicated guideways only adds to the already bloated price tags of transit projects. After conducting an analysis on light rail costs, Richmond (1998) adds support with, "...the capital costs of the Long Beach [CA] light-rail system was \$881 million, compared to the \$168 million in capital costs that would have been required for an equivalent bus system."

Second, the costs involved in the daily operation of these various transit modes also vary dramatically. The costs required to run the vehicles, pay wages, run stations and stops, and provide operation information are all necessary to keep a health transit system running. It is in this regard as

well that busses also have lower costs compared to rail. Richmond (1998) adds, “Most data reported on the operating costs of light rail omit the costs of the feeder buses that bring riders to light-rail stations. Ignoring these costs, the average operating cost for light rail is somewhat higher or perhaps slightly lower than for equivalent bus lines. Once, the cost of feeder busses is included, light rail is more expensive than equivalent bus lines.” Sullivan (2009) continues with, “The lesson for planners is clear: With the possible exceptions of New York City and Chicago, which have corridor volumes exceeding 30,000 passengers per hour, an integrated bus system is likely to be more efficient than a modern fixed-rail system like [the Bay Area Rapid Transit]. Recent experience with new heavy-rail systems in other metropolitan areas confirms the results of the earlier study. Ridership on new systems [in 1972] in Washington, DC; Atlanta; Miami; and Baltimore has fallen well short of levels required to make heavy rail less costly than bus systems.” In virtually all circumstances, bus transit is fiscally more responsible and efficient for the investment necessary to construct transit systems in many of America’s neighborhoods, towns, and cities.

In times of growing environmental concern regarding emissions and energy use, bus transit is not as environmentally friendly nor clean as rail but a case for improving bus ridership to reduce pollution emissions can still be made. Busses are the leading producer of CO₂ emissions amongst all transit modal options. As Figure 1 shows, in average occupancy ridership rates, bus transit emits 0.64 lbs. of CO₂ per passenger mile with heavy rail emitting only a third of that and light rail and commuter rail emitting about half. However, promoting the use and ridership of bus transit to levels where seat occupancy is at or near 100% would greatly reduce bus CO₂ emissions by a huge margin with a 72% reduction in pounds of CO₂ emissions per passenger mile. While all three rail modes also experience a reducing in CO₂ emissions at 100% occupancy, bus transit experiences the greatest reduction and reduces it to the point where all four modes’ (bus, heavy rail, light rail, commuter rail) emission rates are now competitive with one another. Therefore, there is a great deal of incentive to promote bus

ridership as it stands to gain the most from an increase in ridership in terms of efficiency and emission reduction compared to rail transit. Through this, it will not only reduce emissions by eliminating or decreasing the amount of emissions produced by private automobiles but it will also reduce emissions already produced by bus transit per passenger by increasing occupancy rates.

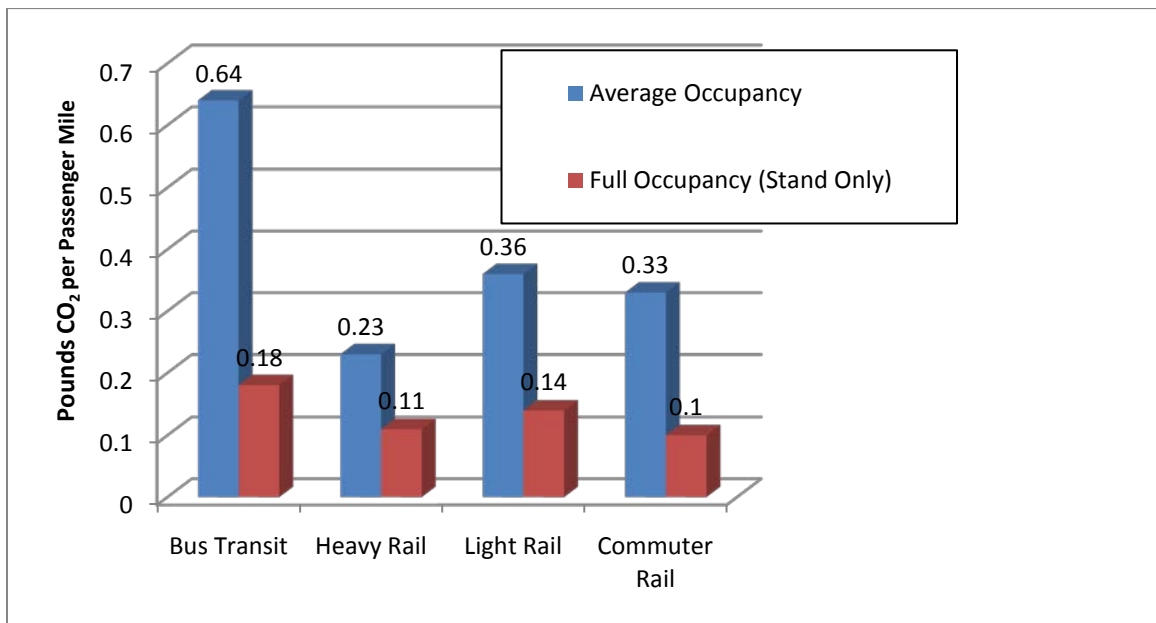


Figure1: Public Transit CO₂ Emission Rates Source: Federal Transit Administration

BUS TRANSIT AS IT IS TODAY

Bus transit today is in a poor state of economic viability. Plagued with rising costs and a lack of constant and reliable ridership, bus transit is slowly becoming less and less popular. With this downward trend, researchers have seen a number of attempts to shift ridership from automobiles to public transit but, which in the last few years transit bills have done well, and ridership has increased in some cities (partly because of declining individual incomes), national use of public transit declined steadily from 1960 to at least 2000 (Weitz 2008). In fact, numerous cities have cut back on or even eliminated most public transit and others have shifted tax dollars from bus-based systems to light-rail systems, which typically benefit small segments of the transit market (i.e. white, middle class, etc.) (Weitz 2008; Wypijewski 2000; Grengs 2002).

This differs dramatically from the historical goals and intentions transit has held. Historians argue that transit once held the aspirations as a medium for advancing larger social goals with Congress once embracing transit as a legitimate means of redistributing wealth, as an acceptable counterbalance to the damages imposed by a transportation skewed toward the automobile (Weiner 1999). In reality, transit has shifted away from meeting social goals of achieving equity toward the more narrow purpose of relieving traffic congestion efficiency, and is now influenced by a neoliberal political agenda that separates the social from the economic, causing planners to lose sight of the public purpose of mass transit (Grengs 2002). In fact, transit seems to be inadequately serving the people that it is intended to serve. One study has so far as depicted public transit as the poor people's "last resort" where despite one transit system's vast potential ridership, only about three percent of people with jobs used the buses in 1990, and many said they wouldn't dream of riding one today (Wypijewski 2000). With citizens who need to use transit and those who do not choosing to find other modes of transit beyond the bus, it is no surprise that bus transit gets little if any financial and political support.

BUS TRANSIT – THE OPINIONS AND THE FACTS

If bus transit is not supported by those who do not need transit as well as those that do need transit to get around, then transit should first identify why transit is so "taboo" or unpopular before it can begin to structure transit networks to their riders' needs. Many surveys have been conducted to get to the root of the distaste for public transit. One researcher has suggested that negativity towards public transit is deeply rooted in socioeconomic values. Opponents to public transit commonly refer to the movement of "homeless/riff-raff," the "the wrong kinds of people," "undesirables," "bums and drunks," "indigents," or "outside elements" to their neighborhood with the introduction or expansion of public transit (Weitz 2008). It is apparent that involved in these fears or concerns is one of an increase in crime within one's community. Opposition to public transit is often associated with a fear of crime

and within this a fear of crime was also closely linked with a fear of the poor (Weitz 2008). Weitz (2008) adds, "This was not an unreasonable connection for opponents to make: poor persons are e statistically more likely to be convicted of property and violent crimes, and the majority of public transit riders nationally are poor." While many transit researchers do not argue the opinions relating various crimes with the poor population, many do suggest that public transit does not increase crime in the neighborhoods they serve (Sedelmaier 2003).

Another concern embedded in the dislike for public transit deals with ethnic fears. While distaste for minorities is not explicitly voiced in many surveys concerned about public transit, there seems to be an underlying connection between race and socioeconomic status and crime. Studies have suggested that since nationally, more than half of public transit riders are not only poor but also minority and given that white Americans typically believe minorities are disproportionately likely to commit crimes, these statistics may help explain why opponents link criminal activity to public transit (Pucher 2003; Quillan 2002).

Concern over the increase in noise, traffic, and pollution was another major concern of opponents to public transit. While public transit is often used as a tool to combat poor air quality, congestion, and noise pollution, many people have deemed public transit to do just the exact opposite. In fact, like other gas-vehicles, busses do create noise and pollution, and by definition each bus does add one more vehicle to our nation's congested roads. However, researchers have noticed that many opponents to public transit almost uniformly did not believe or did not discuss whether a shift from private automobiles to public transit might help offset these increases in congestion and pollution caused by busses (Weitz 2008). In fact, while many factors contribute to traffic growth, studies show that adding new road capacity leads to more driving over the long term, contributing to additional growth in transportation emissions, therefore an infrastructure program that focuses on expanding

innovative transit while using existing roads more efficiently could effectively help reduce transportation pollution while also improving traffic congestion (Burgess 2009).

A problem associated with the increase in noise, traffic, and pollution that accompanies public transit is the fear in the increase of collisions between public transit vehicles and pedestrians, bicyclists, and other drivers. Common in many *Not In My BackYard* (NIMBY) protests, many of the concerns that arises deal with the dangerous driving styles of bus drivers. These include many complaints like the following, “How many accidents causing injury are needed to make the city believe this is a bad idea? The idea of mixing well-traveled streets with walkers, runners, bicyclists and the proposed buses is a lethal mix!” and “The buses will stop erratically, block visibility, and create traffic jams. This is a recipe for disaster!” (Weitz 2008). In contrast, proponents of public transit believe that bus introduction would reduce the risk of collisions by reducing traffic, by providing an alternative for individuals with questionable driving skills (whether because of youth, age, poor night vision, or substance use, and by shifting the driving to trained, professional drivers) (Weitz 2008).

A concern closer to home is the fear of neighborhood property owners that their respective investments and the neighborhood as a whole will deteriorate in value with the introduction of public transit. Combined with the concerns of the influx of poor and ethnic minorities into the neighborhoods with the poor air quality and traffic congestion brought on by public transit, residents worry about the public transit diminishing their quality of life and ultimately cause property values to decrease (Weitz 2008).

A final reason for opposition of public transit is derived from the qualities of sprawl or the suburbs that so many Americans have come to prefer over more urban neighborhoods and settings. The major demographic trends of the last century have been driven by middle-class Americans’ desire to leave cities behind and to de-link their residences from ethnically and economically diverse cities

(Grengs 2002). Many residents fear that an introduction of public transit into their residential neighborhoods would transform them into more “downtown” like neighborhoods that possess the hustle-and-bustle that so many residents have attempted to avoid by moving farther and farther from the city center. Even further, opponents have stated concerns that not only would public transit bring in individuals from the city but it would also enable their children to travel to those cities without parental consent (Weitz 2008). In contrast, many supporters of public transit have explicitly described public transit as one of the pleasure of urban living coupled with the ability of traveling between the suburbs and the downtown with the ease of public transit provisions (Weitz 2008).

RIDERSHIP THROUGH TECHNOLOGY

The introduction of new technology will play a vital role in improving ridership for bus systems without reducing farebox revenues. Technology will allow transit companies to re-introduce themselves to the communities they serve, communicate with the community and their riders faster and more efficiently, and improve their operations all at a reasonable level of cost and effort. As we embrace technology and use it to aide us in even the simplest of tasks, technology will also aid us in the daunting and difficult task of re-popularizing and reintroducing bus transit to the masses, namely the creative and professional market segments.

COMMUNICATING WITH THE COMMUTER

In an industry where random external events are constantly affecting the daily operation and riders are dependent on the timeliness of services, it is important that transit companies find ways to communicate service issues and failures along the system and actually devote the manpower needed to execute the communication reliably. In order to do this, the transit system must use technology so that

it may reliably locate their busses and, in turn, relay that information to its riders so that they are made aware of their respective waits and can better plan their commute and day.

Within the transit system, this can be done using an automatic vehicle location (AVL) system. AVL systems are used for real-time location monitoring of vehicle fleets and are comprised of various location and radio-based technologies (Hounsell 2004). In order to be able to locate the exact or relative location of busses, a location system must be placed within every bus in a transit system's fleet. The best types of system currently available to transit systems today are satellite-based systems such as GPS (global positioning systems) as they have the advantages of operating flexibly virtually everywhere without the use of roadside infrastructure, are cost-effective, and extremely accurate (Hounsell 2004). Once the location data is collected, it is sent to the transit system's choice of real-time passenger information system and the information is passed on to the rider and commuter.

It is through the real-time passenger information system where the transit system can truly become creative and innovative in how they present information to their ridership base. If a transit agency was simply interested in providing information via its website but also real-time information to riders waiting at bus stations and shelters, the transit agency could provide information in the form of light-emitting diode (LED) dynamic message signs (DMSs), liquid crystal display (LCD) panels, video monitors and/or kiosks (Transportation Research Board Synthesis 68 2006). Through these mediums, the transit agency can provide information regarding real-time arrivals and departures, incident and disruption information, and station and stop information. Hounsell (2004) adds, "Such systems provide valuable information and reassurance to passengers where there is service irregularity (e.g. due to congestion). The information may be perceived as a 'dynamic timetable' and it appears that some passengers feel buses are 'on-time' if the bus arrives according to this timetable even though adherence to the static timetable is the true yardstick of service quality."

Another innovative way in which real-time information can be relayed is via short message service (SMS) or text message. This application would allow transit riders and commuters to either have route information updated to their mobile phone or send a text message to the transit agency via a provided text information hotline to have real-time passenger information for a particular route or line or stop relayed back to the sender almost instantaneously. The Transportation Research Board (2006) conducted a study and suggested that individuals with higher levels of education were more comfortable with advanced technology media such as the Internet and wireless devices such as personal mobile phones to retrieve real time passenger transit information. While providing information via SMS or text messaging is beneficial to the user, it is also efficient and cost-effective for the agency to undertake and supply. The Transportation Research Board (2006) supports this with an example of Auckland, New Zealand's call center and SMS service, "Our Rideline call centre costs us \$1.80 per interaction with the public. Compare that with our new services, the web, WAP, and SMS, which cost us \$0.09 per interaction. Furthermore, the call centre costs just under \$2 million a year to operate and handles 1.4 million calls per year; the ongoing costs of the website, the WAP, and SMS services combined is \$60,000 a year and between them already handle 600,000 calls annually – and the number keeps on rising, about 30% every six months."

Other forms of information provided via the real-time passenger information systems can be provided while onboard the bus which would allow the transit riders or commuters to better inform themselves of their current location and commute or trip information. The type of information that can be provided by information systems onboard the bus vehicle include: next stop information, route information, and destination information (Transportation Research Board Synthesis 68 2006). By providing information at this level, this will allow users to be knowledgeable of their commute and create a sense of security in knowing where they are going and the remaining time to their destination and create an overall perception of service quality for the rider.

It is undeniable that the provisions of real-time passenger information mediums at all levels promote customer service and perception improvements of the transit agency. Pecheux (2005) provides, "A survey of the Portland TriMet real-time passenger information system showed that the system was easy to use and that more than 50% of the users were satisfied with the bus service in the presence of such information. The riders also perceived increased safety and comfort in the presence of the real-time arrival information, because they were aware of the wait at the stop." In another survey conducted on the Island Explorer transit system in Maine, 54% of the respondents strongly agreed that the real-time departure signs helped them decide to use transit, and 43% strongly agreed that the on-board automated annunciation system helped as well (Zimmerman 2003). While providing a real-time passenger information system as a way to keep riders and commuters informed is an expensive project and undertaking, it is certainly evident that the benefits provided by the system are numerous not only to the riders but to the agency as well.

INTRODUCING TRANSIT TO SOCIAL NETWORKS

It is undeniable that social networking sites such as FaceBook, Twitter, and MySpace are the new fads of the 2000s. These various sites enable users to keep in contact with friends and family but also allow users to stay abreast in various news and announcements via official corporate and fan sites. In keeping with the age of technology, these sites can reintroduce transit to the technologically hip and creative class in many modern cities. In fact, more than 50 transit agencies in the United States have some sort of social media presence (Eirikis 2010). The presence of social media and networking allows transit agencies to advertise, market, and make announcements on their own behalf without the need of a middleman such as a newspaper, commercial, or professional advertising agency. Eirikis (2010), adds that the age-old problems of reporters getting the facts wrong or misquoting are solved by social media. Transit agencies are now able to make announcements without notice and distortion. They can

do so with the hit of a button and retract an announcement just as simply as it was published. The benefits of social media to the mass transportation agency and community include: direct communication that is not filtered or distorted, it is less expensive than traditional forms of advertising; the ability to communicate in real time, transit agencies can “tweet” (via Twitter) riders when delays may or do occur, and it creates an interactive dialogue with those most interested in hearing about the agency and its services (Eirikis 2010).

The use of social media also allows transit agencies to interact with its riders and get honest and up-to-date feedback on its services. The ability of users to follow transit agencies on Twitter or to become “fans” of transit agencies on FaceBook allow users to post questions and comments on the respective agencies’ page and allow the agency to respond back to the user. Eirikis (2010) suggests that people feel appreciated when they feel like their concerns are heard and addressed, and not simply ignored. However, the time must be taken to maintain these sites, answer riders’ questions and comments, and constantly update the sites with new and service impacting announcements. If not, the page will become as outdated or unhip as the transit agency may already appears to the user. Having a rarely updated Twitter or FaceBook page only serves to undermine the positive effects of social media since rather than an inviting and open forum for discussion and news, it becomes stale and unappealing (Eirikis 2010).

Use of various social networking sites has proven to be successful for many transit agencies. It has allowed transit agencies to reach a variety of users and broadened its exposure beyond its advertising budget, geographic boundaries, or typical transit rider. The Orange County (CA) Transportation Authority receives approximately 300,000 mentions per week on social media networks, which is a high number considering it is without the associated cost of paid advertising or promotions; it is so successful that it has integrated social media initiatives into their public outreach efforts calling on

their followers to engage in various public engagement events (Eirikis 2010). While many transit agencies may fear a barrage of negative comments and criticism on these various social networking sites, the magnitude of these events has actually failed to meet expectations and, in fact, positive comments regarding social networking initiatives and operations as a whole have seemed to be the norm. Greater Bridgeport (CT) Transit has advised, “Since the page went live we have had nothing but positive feedback and legitimate comments or observations about our services and we have been able to respond to all of them. While FaceBook allows page administrators to ‘hide’ or delete comments, we did not plan to and have not had to use this feature” (Eirikis 2010).

GREEN IS GOOD

Sustainability is a growing trend redesigning many aspects of our daily lives. Sustainability or “greening” has redeveloped the way many buildings and homes are constructed, the amount of water our shower dispenses or toilet flushes, and even determines many aspects of urban design such as using local plants for landscaping or creating urban agriculture initiatives using hydroponic initiatives. In fact, it is becoming trendy to be “green” by doing such things as driving hybrid vehicles, eating organic foods, recycling, and bicycling. Public transit has also been able to join the “sustainable” or “green” initiative by using hybrid busses or busses that utilize cleaner natural gas technology. Researchers have found that one of the most important reasons for using transit was environmental (Habib 2010). In fact, studies reveal that publicity or campaigns for the environment together with convenient transit service may significantly increase transit usage (Habib 2010). By rolling out a re-fleeting program that introduces busses that utilize cleaner natural gas, a transit agency not only suggests that it is concerned about the welfare of the environment and the health of the community it serves but that it is able to adequately keep up with new technology and trends as they are introduced. However, Habib (2010)

warns, “People may sacrifice comfort for the environmental friendly nature of transit, but reliability and convenience are also very important.”

MULTI-TASKING TRANSIT

Many transit riders and transit agencies have come to the realization that public transit will never be able to competitively compete with the private automobile in terms of speed and convenience. With that, transit agencies must come up with innovative ways to attract riders to its services that have the ability to rival the offerings of a private automobile or commute. One advantage that public transit commuting has over private automobile commuting is offering the commuter the ability to multi-task or more specifically, allowing the commuters to take care of other things while getting where they need to go. One innovative aspect is providing wireless Internet access aboard busses so that commuters can read the newspaper, keep up with the stock market, or even conduct business within the bus. Surveys have noticed that commuters have been able to leave their homes much later than usual because some companies now view their commutes to work via transit as work time because commuters can be online the entire commute in to work (White 2009). This coupled with employer incentives to commute to work via transit rather than driving and parking makes it a win-win situation for both the employer and employee. Providing internet access onboard busses attracts the creative and young professional classes because it adds a dimension to transit services that cannot be rivaled by carpools or driving alone (White 2009).

URBAN (PUBLIC TRANSIT) DESIGN

Cities often hire architects and urban designers to revitalize their streets and neighborhoods. It is remarkable what a widened sidewalk, a detailed lamp post, or a colorful awning can do to the aesthetics of a building, walkway, or path. There is no reason why the same concept at improving aesthetics to increase accessibility and perception cannot also be used to popularize public transit.

“Companies achieve greatness, measured not just by sales, but also by customer loyalty and enthusiasm, by making an all-important element of the customer experience” (Hollenhorst 2010). Hollenhorst (2010), even goes further to ask a number of questions to the improving transit agency, “How is your website design? Will a first-time visitor easily find a route, schedule, fare information? Is each page presented in a clean attractive format, or does your site look neglected, with designs from 1999, news releases from 2006, and no widgets to wow your customers?”

Design can transform more than the website of a transit agency. For example, design can transform one of the most visible aspects of a transit agency: the bus stop/shelter. MIT’s EyeStop bus shelters are over the top in their features which include a futuristic all-glass design, solar power, weather monitors, real-time bus location displays, and a wireless internet signal (Hollenhorst 2010). However, while really intriguing and innovative, bus shelters and stops do not need to be futuristic to be inviting. Infusing local flair or culture into one’s bus shelters and stops is enough to deem any transit agency trendy. Hollenhorst (2010) adds, “Bus stop shelters with a signature design serve as a city-wide acknowledgment that your agency does something right.” Good design is not only pleasing to look at but also conveys a sense of pride, pride not only of the home city but of the agency as well. Just as urban design makes more neighborhoods and cities more inviting and appealing, the same concept can make transit agencies and transit ridership less “taboo” but trendier.

REINVENTING THE BUS SHELTER

After buses, the bus shelter is the most visible component of a transit system and agency. Just like the bus, the bus shelter is used by most transit riders and commuters but it also seen by pedestrians and drivers who happen to pass by the bus shelter. With this in mind, it is important for transit agencies to view bus shelters as a representation of the transit agency and promote, maintain, and construct

them with pride. One option to provide some depth to the bus shelter is to provide lighting. Not only will this improvement highlight the bus shelter and its location to riders and commuters looking for them during the early morning or evening but it will also provide a level of safety, security, and convenience while they wait for the bus. Groark (2003) observes, “Pace introduced new solar-powered illuminated bus stops at 13 locations. The hi-tech equipment, which attaches to existing bus stop poles, provides on-demand lighting for the passenger waiting area, and a flashing beacon to notify bus drivers that a rider is waiting at the stop.” Additionally, solar-powered safety lights constructed at bus stops throughout West Palm Beach, Florida offer riders an illuminated area as they sit in comfort waiting or reading and allows drivers to spot riders in areas where they are often not seen (Florida State University 2004). The electricity needed to power these lighting systems can be easily provided sustainably through solar and wind-power technology. The equipment needed easily attaches to bus stop poles and includes built-in solar or wind turbines to charge batteries for about 200 hours on a 90-minute charge of daylight with each device costing approximately \$1,000 per unit or bus shelter (Florida State University 2004).



Figure 2: MIT EyeStop Bus Shelter Source: MIT SENSEable

information to the rider and commuter about arrival and departure times and stop information that is lacking in so many bus shelters provided today. A second option would be to not only provide up-to-date route and stop information but to take it one step further and provide information kiosks to assist riders and commuters with trip planning and also provide information such as weather, news, and

Another option to improve the design of bus shelters would be to increase or rather implement amenities to the bus shelters for the riders and commuters. As discussed earlier, real-time passenger information systems can be implemented within the bus shelter. This would provide up-to-date, reliable

advertisements. A bus shelter and bus stop designed by architects and engineers at the Massachusetts Institute of Technology vowed to remove the tedium of waiting for a bus as seen in Figures 2 and 3. Carlo Ratti (2009), the head of the SENSEable City Lab at MIT, added, “At the touch of a finger, passengers can get the shortest bus route to their destination or the position of all the buses in the city. The EyeStop will also glow at different levels of intensity to



Figure 3: MIT EyeStop Bus Stop Source: MIT SENSEable

signal the distance of an approaching bus. Riders can plan a bus trip on an interactive map, surf the Web, monitor their real-time exposure to pollutants and use their mobile devices as an interface with the bus shelter. They can also post ads and community announcements to an electronic bulletin board at the bus stop, enhancing the EyeStop’s functionality as a community gathering space.”



Figure 4: Ikea Sponsored Bus Shelter Source: toxel.com

While the EyeStop or a simplified version of it may be a bit too sophisticated and expensive for a transit agency to implement and maintain, there are other options in which a transit agency can improve or change the design of their bus shelter network. An option that some cities and transit agencies have undertaken is to have local businesses sponsor bus shelters. This would allow the respective businesses and/or companies to decorate the bus shelter to their tastes and standards while allowing them to uniquely advertise their product or business to the community. Corporations such as Ikea, Coors Light, and Caribou Coffee have joined the band wagon of bus shelter advertising and taken it to a whole new level as seen in Figure 4 and 5. The Caribou Coffee Co. began advertising their new line of breakfast sandwiches in Minneapolis using bus shelters as their canvas and turning them into pieces of art that look like toaster ovens that actually produce heat to help aid

commuters during the bitter Minnesota winter. Taylor (2011) adds, “The shelters with their glowing ceiling coils have been such a hit that other neighborhoods in Minneapolis have been asking for them. They were scheduled to be in circulation only until the end of January but the demand could keep the three shelters in



Figure 5: Caribou Coffee Sponsored Bus Shelter Source: toxel.com

rotation for much longer.” For transit agencies with budget deficits or the inability to find funding aesthetic improvements, this is a great option as it allows bus shelters to be modernized and beautified with little or no financial responsibility from the agency. It also provides an added sense of pride for the home market and community for the transit agency with little effort provided internally other than to find businesses up for the task of sponsoring a bus shelter.

STYLIZING THE TRANSIT MAP

Transit maps are an important tool transit agencies have in communicating various services to its riders and commuters. Through the use of maps, riders and commuters can confidently decide which routes to take, what time to take the trip depending on departure and arrival times, and also which stop to take closest to their origin and destination points. With so many decisions being made through the use of a transit map, the information provided and the manner in which it is presented is vital to the success of the map and the transit agency. Despite the maps importance at conveying important information, ironically, it was found that many agencies produced substandard designs that were clearly harming their customers’ ability to understand and use the services provided by the transit agency (Cain 2010). Map design is an art but an easy skill to obtain as many guidelines on good design are available to transit agencies. Many of the issues that lie within bad transit map design includes route map and schedule layout in which customers have to flip back and forth between bus route illustrations and

timetables, tabular schedule use where users have a hard time determining departure and arrival times, and finally route map scaling issues in which users have a hard time distinguishing distances and duration times due to poor scaling choices (Cain 2010). Transfort, a transit service provider in Fort Collins, Colorado invested funds to improve their bus route maps in order to enhance both communication and ridership as seen in their before-and-after maps seen in Figures 1 and 2 in the Appendix. They improved their maps due to the finding that their substandard map designs were clearly harming their customers' ability to understand and use the services provided (Cain 2010). Upon the redesign of their maps, 71% of their passengers said they first learned about Transfort from the bus schedule, and 65% said they rode the bus more than they did a year ago (Cain 2010). This implies that users were finding it easier to interpret the bus schedule and route structure and this improvement was positively affecting their modal choice. In addition, Transfort found that in the first seven months of 2008 (postdesign) ridership was 17% higher than the same period of the previous year (Cain 2010).

ATTRACTION THROUGH ART

While not a part of the normal service provided by transit agencies, transit art can be an important tool transit agencies use to attract new riders as well as improve the appearance and perception of these companies. Hubbard (2010) suggests, "Not only does art add a human dimension to transit, but it also may help build ridership, enhance the acceptability of transit services as a positive element in neighborhoods, moderate community concerns about disruption due to construction, improve passenger comfort and safety, and reinforce the spirit of the community." Adding transit art to bus stops and shelters, as seen in Figure 6, would reduce the sterility and heterogeneity of bus shelters and stops and provide some



Figure 6: Bus Shelter Art Source: cityofart.net

visual stimulation during times of waiting and possible frustration. Transit art can take on a number of

sizes and shapes including art as small as a sculpture or a small mural on a sidewalk but it can also be as large as the whole bus shelter as mentioned above. Not only does transit art improve the aesthetics of a bus shelter or stop but it also enhances the look of a street or neighborhood. Hubbard (2010) adds, “Art enhances the public space, defines local character, positively differentiates the community, and may provide quantifiable benefits in reduced costs for vandalism such as graffiti. In an era where every community must market its amenities to attract investment and economic development in an increasingly sophisticated marketplace, art in transportation may successfully enhance the local culture and distinguish a community.” Placing such an inviting piece of art at the beginning of a commute would be a great way to the start of a positive view on a commute on public transit that is faulted for so many reasons using little costs and effort by a public transit agency. However, it is important to note that taste in art is highly relative and subjective and that important consideration must be made to ensure that the pieces chosen appeal to many instead of a few.

MAKING INNOVATION AND AESTHETIC INNOVATION IMPLEMENTATION A REALITY

A number of options are provided above that aim at inviting commuters back to the bus transit system. While they differ in their approach and in their effect, the options provided above also differ in many other ways including costs (capital and operational), roll-out capacity, and effectiveness. The following discussion will provide an analysis of all the options provided above and highlight their strengths and weaknesses based on the criteria being used and a ranking system will be presented which will ultimately highlight the strongest candidates for increasing bus transit ridership without reducing farebox revenues.

CAPITAL COSTS	
RANKING	PROJECT
1	SOCIAL NETWORKING
2	BUS SHELTER SPONSORING
3	TRANSIT MAP REDESIGNING
4	PUBLIC TRANSIT ART
5	SMS/PHONE/APPLICATION INFORMATION
6	BUS SHELTER/STOP TRANSFORMATIONS
7	REAL TIME INFORMATION SIGNAGE (BUS)
8	REAL TIME INFORMATION SIGNAGE (BUS STOP)
9	WIRELESS INTERNET ACCESS
10	SYSTEM "GREENING"

Table 2: Capital Costs Criteria Evaluation

First, an analysis of the capital costs required to rollout the options provided above are examined. Capital cost is an important consideration of any project. The initial cost of implementing projects can have important and influential decision-making as they are the most expensive consideration of any project after operational costs. In Table 2, all of the options are ranked accordingly to their capital costs in ascending order. As one can see, the project option of promoting public transit through social networking is the most affordable project in terms of capital costs. Social networking sites such as FaceBook and Twitter have enabled companies to create fan sites and information mediums at virtually no cost to the transit system. This places transit companies at a huge advantage of advertising and relaying information for free to their followers and users through two of the most highly used platforms this decade with an astonishingly huge number of followers numbering at over 500 million for FaceBook alone (Grossman 2010). Using this communication medium will not only allow transit companies to communicate with their riders but it will also allow them to showcase themselves to an audience that may not have been accessible at first using traditional advertising and marketing methods but now with minimal capital costs. The most expensive option when considering costs

turned out to be system “greening” or the re-fleeting of a transit system’s vehicles with models that are more environmentally friendly. While the level of investment is highly dependent on the size of the system, the other projects are also highly dependent on system size therefore keeping system “greening” as the most intensive capital-cost project. With price tags costing up to \$50,000 per vehicle, the costs can begin to really add up when considering a re-fleeting of an entire system (hybridcenter.org 2011). In addition, surely, adding only one or two busses to a fleet will provide little incentive or encouragement for those that are interested in becoming “green”-friendly to consider bus transit as a viable alternative.

OPERATIONAL COSTS	
RANKING	PROJECT
1	TRANSIT MAP REDESIGNING
2	SOCIAL NETWORKING
3	BUS SHELTER SPONSORING
4	REAL TIME INFORMATION SIGNAGE (BUS STOP)
4	REAL TIME INFORMATION SIGNAGE (BUS)
4	SMS/PHONE/APPLICATION INFORMATION
7	PUBLIC TRANSIT ART
8	BUS SHELTER/STOP TRANSFORMATIONS
9	WIRELESS INTERNET ACCESS
10	SYSTEM "GREENING"

Table 3: Operational Costs Criteria Evaluation

Second, an analysis of the operational costs required to maintain and run the options provided above are highlighted. Operational costs are an important factor to consider when looking at projects since these costs are paid throughout the life of the project and may increase over time thereby compounding the overall costs of a project. Similar to the table provided above, the project options mentioned earlier are ranked according to their operational costs in ascending order seen in Table 3. In this analysis, the project option of transit map redesigning outranked social networking as the cheapest

option in terms of operational costs. In fact, the operations costs involved with redesigning the map of a transit system are made up mostly of capital costs which encompass the design and printing of the transit maps. While the maps will need some labor which will be required after the map is printed to strategically post them throughout the system's stops, shelters, and map holders, very little additional cost will be required until extra maps will need to be printed or new maps will need to be designed. Social Networking still remains a cost-effective option but loses the cheapest option slot due to the manpower needed to keep the information on these sites up-to-date, reliable, and consistent. The project option of system "greening" remains to be the most expensive option in terms of operational costs. While they are cheaper to operate and maintain than older-generation bus vehicles, the labor and maintenance costs required to operate these buses are just too high to compete with the other lower cost and labor-intensive projects suggested. In fact, a number of the suggested projects do not require a large amount of labor to maintain and operate these projects. The more technological-centered projects including real time information signage (bus stop), real time information signage (bus), and SMS/phone/application information require only a small information technology team to manage the information database and ensure that the information being provided and displayed is accurate and relevant, hence the same ranking for all three project options.

ROLL-OUT CAPACITY	
RANKING	PROJECT
1	SOCIAL NETWORKING
2	SMS/PHONE/APPLICATION INFORMATION
3	TRANSIT MAP REDESIGNING
4	REAL TIME INFORMATION SIGNAGE (BUS)
5	SYSTEM "GREENING"
6	WIRELESS INTERNET ACCESS
7	PUBLIC TRANSIT ART
8	BUS SHELTER SPONSORING
9	BUS SHELTER/STOP TRANSFORMATIONS
10	REAL TIME INFORMATION SIGNAGE (BUS STOP)

Table 4: Roll-Out Capacity Criteria Evaluation

An analysis of the roll-out capacity of the project options suggest above is now provided. A look into the ease at which the projects can be rolled-out based on the size of the transit system is analyzed. This is another important characteristic to consider because many projects become infeasible when the actual scope of rolling-out a project becomes too cost-prohibitive or too large for a transit system to undertake. The project options provided above are ranked at the ease of their roll-out capacity and ranked accordingly in ascending order in terms of roll-out capacity difficulty and displayed in Table 4. In this analysis, social networking is the project option with the easiest level of roll-out capacity. Social networking is not dependant on the size of a transit network and can be used either by transit systems that are extremely large (e.g. New York Metropolitan Transit Authority) or tiny transit systems such as those that exist in small town or rural communities. The use of social networking as a tool to increase ridership for bus transit is virtually limitless and is only limited on the creativeness and innovativeness of the transit system. The project options with the most limited level of roll-out capacity are those that involve bus stops and shelters. This is due to the fact that bus stops and shelters are extremely numerous in nature. Bus shelters and stops out-number bus vehicles at tremendous rates. For

example, in 2010, the New York City Bus, a subsidiary of the New York Metropolitan Transit Authority had 4,372 busses for its fixed-route services and 12,499 bus stops and shelters throughout its service network (MTA 2011). Having over 12,000 bus shelters and stops to reconfigure to either provide real-time information displays, transformations, or simply find sponsoring would be a feat both in terms of labor and cost for any transit system to undertake. With this, project options which focus innovation and aesthetic improvements at the bus vehicle level are a bit more practical than those at the bus stop or shelter level. Installing real-time information, hybrid vehicles, and/or internet access on busses is much more achievable than those aimed at improving the bus stop. However, the roll-out capacity of the projects at the bottom of the ranking system becomes much more accessible and easier to achieve as the transit network becomes smaller while those at the top tend to stay at the same ease level and capacity.

IMPROVEMENT IN TRIP QUALITY	
RANKING	PROJECT
1	WIRELESS INTERNET ACCESS
2	SMS/PHONE/APPLICATION INFORMATION
3	BUS SHELTER/STOP TRANSFORMATIONS
4	REAL TIME INFORMATION SIGNAGE (BUS STOP)
5	REAL TIME INFORMATION SIGNAGE (BUS)
6	BUS SHELTER SPONSORING
7	PUBLIC TRANSIT ART
8	TRANSIT MAP REDESIGNING
9	SYSTEM "GREENING"
10	SOCIAL NETWORKING

Table 5: Improvement in Trip Quality Criteria Evaluation

The effect at which these project options improve the trip quality for the transit rider and commuter is also analyzed. This is important because while a reintroduction of bus transit is a main focus to bring riders back to the system, one must also improve the ride quality to become competitive with those such as the private automobile and/or train. The project options mentioned above are

ranked in descending order in their ability to improve trip quality and portrayed in Table 5 above. In this analysis, wireless Internet access proved to be the project option that improved trip quality the most. This was due to the fact that having Internet access onboard busses allowed riders and commuters to multi-task (i.e. commute and work). This is something that a commuter who uses a private vehicle would find difficult, if not impossible, and possibly dangerous to undertake. Having Internet access onboard busses would offer an amenity that is not available to private vehicles and allow their commutes to become more productive improving the trip quality and efficiency of commuting by bus transit. SMS/phone/application information was also highly ranked as an option to improve trip quality due to its ability to reduce the wait time of commuters and riders at transit bus stops and shelters. Having the innate ability to know how far a bus is deviating from its published schedule or knowing how much time one has until the next bus arrives in real time is valuable information to a commuter or rider. Having this information allows them to plan their day accordingly affording them the ability to pick up their dry-cleaning or get some coffee instead of wasting those valuable minutes at the bus stop or shelter with no clue what time the bus will arrive despite what the schedule suggests. Researchers who have studied the effects of real time information have stated that having this type of dynamic information gives the perception of a bus running on-time when the real-time information is accurate despite the bus being off-schedule according to the published schedule or timetable, which is a huge benefit to the transit system provider and a time-saver to the commuter or rider (Hounsell 2004). Despite being highly ranked in previous analyses, social networking seems to do little to improve the trip quality of a rider or commuter. Even though it might be cited as a possible reason in which new riders and commuters are introduced back to bus transit, it does little to improve the quality of the ride when actually onboard the bus. Another project option that does little to improve the perceived quality of a trip is system “greening”. While using more environmentally friendly hybrid busses may attract the environmentally conscious citizen, it does little to improve the quality of a commute. Just like a non-

hybrid bus, a “green” bus gets commuters and riders from point A to point B, uses the same roadway infrastructure and fights the same traffic jams as other busses thereby making few accomplishments in improving their commute using a more eco-friendly vehicle.

RIDERSHIP INCREASE ABILITY	
RANKING	PROJECT
1	SMS/PHONE/APPLICATION INFORMATION
2	BUS SHELTER/STOP TRANSFORMATIONS
3	REAL TIME INFORMATION SIGNAGE (BUSSTOP)
4	REAL TIME INFORMATION SIGNAGE (BUS)
5	BUS SHELTER SPONSORING
6	WIRELESS INTERNET ACCESS
7	SOCIAL NETWORKING
8	TRANSIT MAP REDESIGNING
9	PUBLIC TRANSIT ART
10	SYSTEM "GREENING"

Table 6: Ridership Increase Ability Criteria Evaluation

Finally, a look into the potential increase in ridership for each project option has is analyzed. This is extremely important because it highlights the relative strength of each project option and ranks them according to their perceived ability to increase bus transit ridership upon its relative implementation regardless of costs, capacity, and trip quality improvement. This analysis is strictly based on how each project option may appeal to the non-bus transit riding public, namely the creative and young urban professional classes. Seen in Table 6, the projects mentioned earlier are ranked in descending order at their ability to popularize bus transit, reduce the stigma specifically associated with bus transit, and encourage and maintain the use of bus transit. The SMS/phone/application Information project option ranks highest in potentially increasing ridership on bus transit without reducing farebox revenues. This innovation and technology is mostly highly ranked because it puts value on the time of the commuter. Having the ability to reduce the time spent waiting for a bus at a bus shelter or stop and allowing commuters and riders to plan their day accordingly in advance is a huge advantage for them

and makes bus transit a more reliable option. This type of technology is more efficient than projects such as bus shelter/stop transformations, real time information signage (bus stop) and real time information signage (bus) because it allows commuters and riders to plan their commutes accordingly from home or office rather than waiting until you arrive at the stop or shelter to obtain the proper time-sensitive information. At that point, changing a commute to reflect the new departure/arrival time may prove to be too late thus pinning the bus transit service as unreliable. In yet another analysis, system “greening” also takes the lowest ranking spot. In this ranking, system “greening” is predicted to increase ridership the least since those that are environmentally friendly may more than likely already be riding transit to reap the environmental benefits of transit vs. car. Those that are using their private automobiles to travel may find lack the apathy to switch over to a mode of transit that is more environmentally friendly than another mode of transit that was already more environmentally friendly than their private automobile. Unfortunately, system “greening” may prove to only be a gimmick or a publicity stunt for the transit agency.

PROJECTS	CAPITAL COSTS	OPERATIONAL COSTS	ROLL-OUT CAPACITY	IMPROVEMENT IN TRIP QUALITY	RIDERSHIP INCREASE ABILITY
SMS/PHONE/APPLICATION INFORMATION	5	7	2	2	1
SOCIAL NETWORKING	1	2	1	10	7
BUS SHELTER SPONSORING	2	3	8	5	5
TRANSIT MAP REDESIGNING	3	1	3	8	8
REAL TIME INFORMATION SIGNAGE (BUS)	7	5	4	5	4
BUS SHELTER/STOP TRANSFORMATIONS	6	8	9	3	2
REAL TIME INFORMATION SIGNAGE (BUSSTOP)	8	5	10	4	3
WIRELESS INTERNET ACCESS	9	9	5	1	6
PUBLIC TRANSIT ART	4	4	7	7	9
SYSTEM "GREENING"	10	10	5	9	10

Table 7: Criteria Evaluation Score Totals

Using the ranking values of all the criteria, an overview of the ranks is presented in Table 7 on the previous page. The project option that appears to be most useful is SMS/phone/application information. This is no surprise because it was ranked highly in three out of five categories similar to that of social networking, which appears to be the second most useful project option. Rounding out the top five project options included social networking, bus shelter sponsoring, transit map redesigning, and real time information signage (bus). This is a fairly well-rounded top five as it hits five distinctly different aspects that will help improve bus transit ridership and perception. SMS/phone/application information aids in providing real-time reliable information to commuter and rider. Social networking aims at improving the image of transit system companies to those who find transit as out-of-date or style and providing a more contemporary and trendy approach at marketing to the creative and young urban professional class. Bus shelter sponsoring will allow many shelters to be redesigned to reflect a more local flavor and become a neighborhood and city attraction as each shelter differs in style and taste albeit at little cost to the transit system company. Transit map redesigning will aid in the accessibility and approachability of the transit network as it will simplify and streamline the information being portrayed by maps and make trip planning easier to conduct using newer and easier to use maps and diagrams. Finally, real time information signage (bus) aims at improving the quality of rides had onboard busses. This project option provides real-time location information for passengers onboard busses to reduce the unknowing feeling aboard busses regarding current location, time till destination, and next-stop information especially for those without access to the SMS/phone/application information project option. While it remains an environmentally-responsible project option, system “greening” just could not avoid being placed in the lowest rank in many of the categories. In fact, many of the project options in the bottom five were ranked last or toward the lower ends in many of the criteria being analyzed with the exception of wireless Internet access. Despite being in the bottom five, wireless Internet access was ranked highest in the criteria regarding the potential to improve trip

quality. This feature is a definite asset to have in any transit system that would rival even the private automobile. With this, more research should be conducted to test the true feasibility of its implementation as its potential to improve trip quality is truly impressive.

IMPROVING METROPOLITAN ATLANTA RAPID TRANSIT AUTHORITY'S BUS RIDERSHIP USING THE TOP FIVE

It is no secret that many of the busses in MARTA's route system run empty especially during non-peak hours and weekends. The stigmas that transit (especially busses) operate for the poor and the minorities lives alive and well in this auto-centric metropolis. While MARTA has made major strides at improving transit ridership by offering educational discounts, free parking, and commuter programs, this increase in ridership has been swayed mostly towards its heavy rail services. As one can see many of these increases have been instigated by free or discounted programs to encourage people to use transit, but fares can only get so low. In order to relieve some pressure from MARTA's heavy rail system and to promote the use of bus ridership throughout the metropolitan area, an analysis of implementing the Top five project options ranked above are presented to aim at popularizing and promoting bus ridership here in Atlanta without further reducing farebox revenues.

The first project option of SMS/phone/application information may prove to be a bit difficult for MARTA to undertake. MARTA already has a phone hotline in which commuters and riders can call in and inquire about bus and rail information. It currently lacks a SMS/smart phone application information system. However, the information available to callers who choose to use their hotline are only given schedule information as MARTA currently lacks the ability to provide real-time information for its users over the phone and Internet. In order for this project option to be fully implementable and successful, a publicly-accessed AVL system (e.g. GPS) will need to be implemented in order for real-time information to be available both to MARTA customer service employees as well as its users. The costs

associated with publicly providing AVL data can vary greatly depending on the size of the transit system (FTA 2007). With over 500 buses to provide data for, this technology may prove to be too expensive of an investment for MARTA. However, in 1996, during MARTA's initial stint with AVL, it experienced a savings of \$40,000 per year in data collection costs (FTA 2007). This realized savings may just bring the benefits of a publically-accessible AVL system to outweigh its high costs in addition to the increase in ridership this type of system may encourage in the long run. As the leading project in the ranking system and as the public becomes more conscious of wasted time and dependant on their smart phones, it is vital that MARTA provide an outlet for this market segment and attract them to bus transit.

The second project option of social networking is an option that costs much less than that of the first project option. In fact MARTA does indeed have its own personal FaceBook and Twitter accounts. However, its maintenance and upkeep of both of these sites is quite mediocre. Its Twitter site (twitter.com/MARTAAAlerts) only has about 950 followers. Comparing that with a population over 537,000 persons for the City of Atlanta, this is quite a low following. MARTA also fails in allowing its followers to post "tweets" to the MARTA Twitter page to ask questions about the system which it can answer with only a few short words with very little manpower as it already posts service updates regularly but not consistently or reliably. MARTA's FaceBook (facebook.com/pages/MARTA) page does only a bit better in the number of followers with a following of a bit over 4,450. While MARTA's FaceBook page is a bit livelier and better managed than their Twitter site, it still fails to reap the full benefits of the social network platform. First and foremost, MARTA must dedicate an employee if not a full team to manage these social networking sites and focus on keeping information up-to-date and reliable, invite followers, and also answer questions and promote events and news via the sites. Second, an honest effort must be made to update followers and friends constantly with reliable and accurate information. These social networking sites must be viewed as a medium of communication not only of services offered but also of service alerts and failures so that riders and commuters have yet another

medium of information to avail them with to preplan their commutes to the best of their ability. While service alerts and failures may be looked down upon by commuters and riders, knowing about them in advance may reduce the negativity, bad press, and ill feeling due to the proper communication of these events. Finally, more of an effort should be made to show MARTA's dedication to the community at large through the social networking sites. For example, MARTA can advertise events, festivals, concerts, sporting events that are accessible through MARTA transit services. In the long run, MARTA should use these social networking platforms as a way to connect to the market segments (e.g. creative class, young urban professionals) that have long overlooked MARTA bus transit services as a viable and reliable option to get around the metropolitan area.

The third project option of bus sheltering sponsoring is another option that has very low costs to MARTA other than general administrative costs associated with running the program. Implementing a program of this type may be perfect for Atlanta due to the number of large companies that call Atlanta "home". A number of large corporations that are headquartered in Atlanta may be willing to advertise their business or even show some hometown pride by sponsoring and reinventing or redesigning the shelter to their respective tastes. In fact, Metro Atlanta is tied in 4th place for Cities with the Most Fortune 500 companies at 12 companies which include: Home Depot, UPS, The Coca-Cola Company, Delta Air Lines, Southern Company, SunTrust Banks, Genuine Parts, First Data, AGCO, Newell Rubbermaid, and NCR (Metro Atlanta Chamber 2010). In addition, Metro Atlanta is home to an additional 15 companies in the Fortune 1000 list (Metro Atlanta Chamber 2010). These companies, in addition to other smaller companies, could be solicited to sponsor a bus shelter and have them use it to advertise their business in a unique and artistic way. These bus shelters would not only serve as advertising mediums to both the transit riding public but also to drivers and pedestrians as they drive and walk past them but it would also portray a sense of Atlanta pride and create a tangible connection to the community through this innovative direction.

The fourth project option of transit map redesigning is yet another option that is also cost-efficient and only requires funding for the redesign and printing of transit maps. Other than the obvious task of keeping maps up-to-date and well-stocked in distribution areas, MARTA can do little to better design their maps since many of the recommendations (i.e. highlighting routes and landmarks) provided by designers are already incorporated into MARTA map designs as seen in Figure 3 in the Appendix. However, the biggest fault of MARTA route maps is their tabular scheduling output. Cain (2010) advises, “Customers had difficulty understanding how to use the tabular schedules properly, particularly how to interpolate between time points. The research literature indicates that this is a common problem across the transit industry.” Unfortunately, MARTA cannot eliminate their use of a tabular schedule that accompanies their maps until they equalize their bus headways and simplify their scheduling structure. Another fault of their route maps lies in their scaling. The scaling of the maps and the lack of inclusion of other roadways may cause some confusion to the map user. The maps are not drawn to scale and therefore reduce the intuition of the map user to determine geographic as well as time distances. Including more of the Atlanta roadway structure onto the maps may help map users better acclimate themselves with the respective route of the bus route.

The final project option of real time information signage (bus) is another information technology and communication approach to attracting riders. Currently, no information is given aboard busses regarding current location, next stop, and time duration to its users. Riders must approximate their location and arrival time based on their knowledge of the City or asking other riders for information. Since all of MARTA’s busses are already equipped with AVL/GPS technology, only a few adjustments need to be made to incorporate this technology to supply riders with valuable information. In addition, the information screens that would display this type of information to riders is already installed on all of MARTA’s busses as the “Stop Requested” displays have the ability to display additional information.

This would improve the riders' experience by reducing the anxiety of missed stops and provide an amenity required by those without maps or smart phones from which to retrieve information.

CONCLUSION

It is no tale that bus transit has become an overlooked modal choice for intra-city travel. Having once been the primary mode, it has now become a non-option for many looking to commute to work or get around the city. However, as many tend to overlook it, bus travel has the ability to get travelers closer to where they want to go compared to rail considering bus transit's ability to go from door-to-door. With many transit agencies already facing budget deficits and a shrinking customer base attributable to the car, transit agencies must find new ways to increase ridership through ways other than constantly reducing fares. Transit agencies must find ways for riders to find value not only in the the transit commute but also in the transit fare. With this, transit agencies can find ways through technology and aesthetic innovation to improve the opinion of bus transit and reduce or, hopefully, eliminate the negativity that surrounds it by making the bus appear to be trendier. It is the conclusion of this paper that many of the project options provided in this paper can do so within reason and under a reasonable budget. However, it is also recommended that some effort be made at educating the transit companies' customer base on what the bus transit can do for them and where it can get them. Having a combination of both innovation and education is a winning duo that will surely encourage the use of bus transit for the market segments that currently avoid bus transit services.

APPENDIX

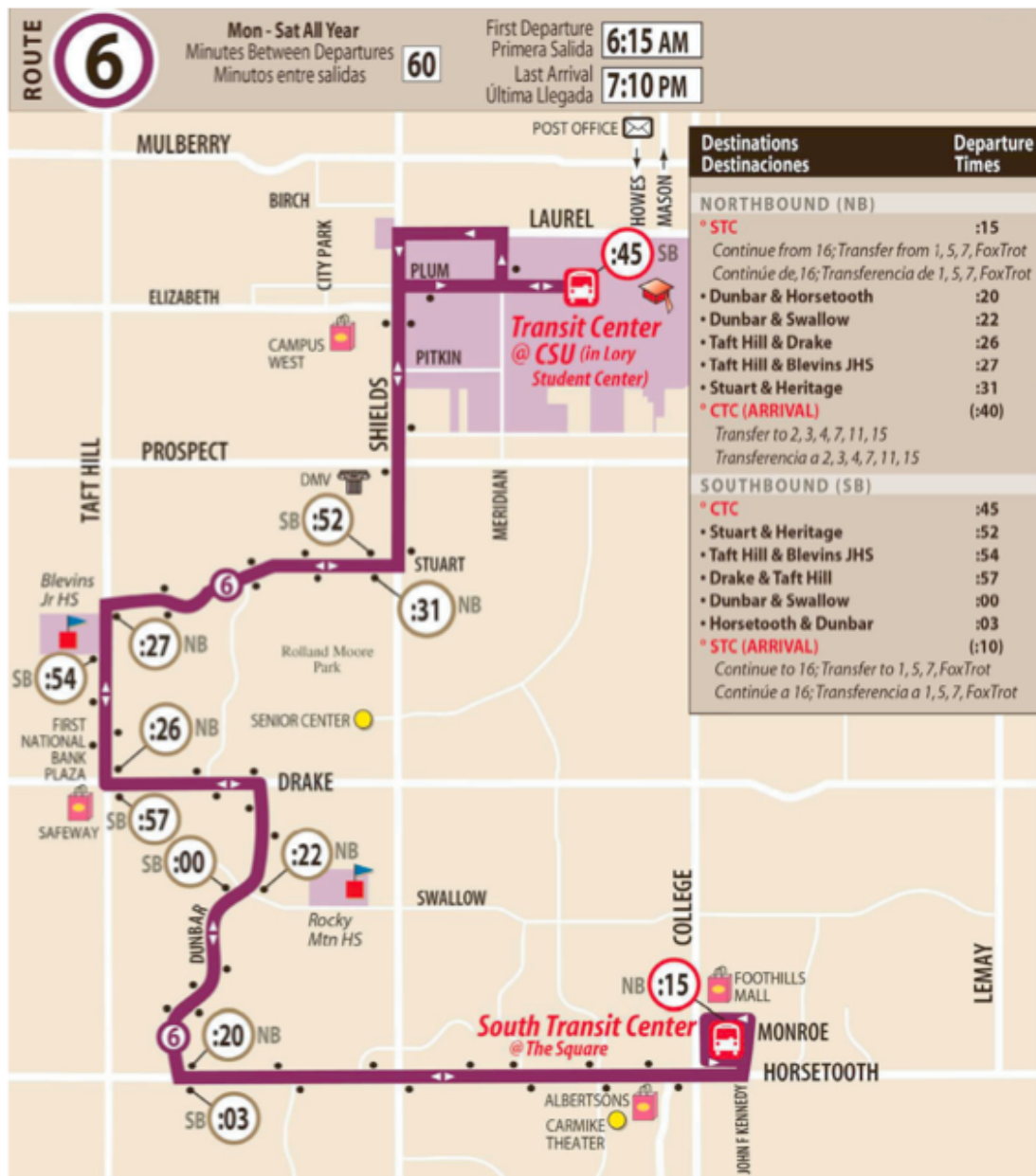
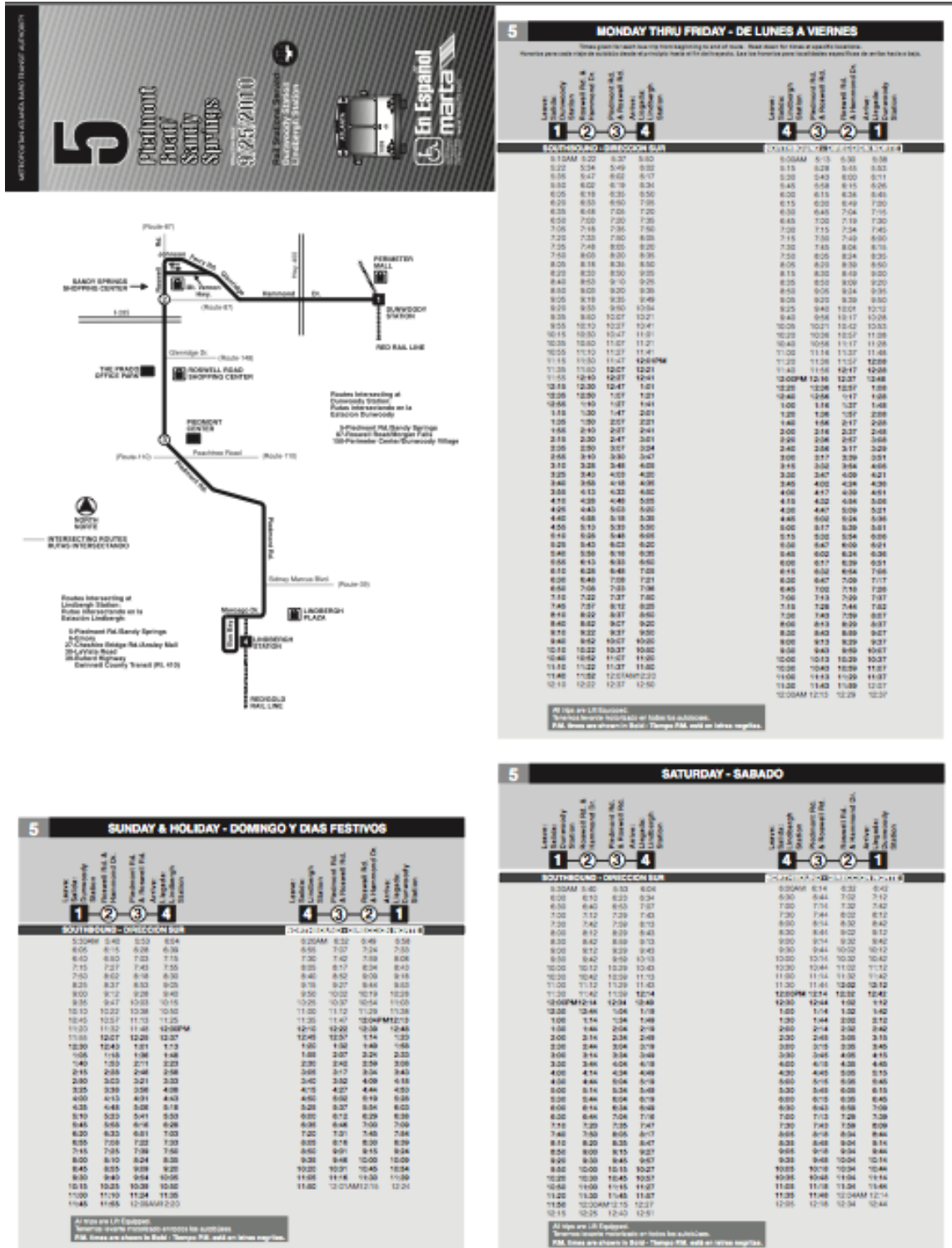


Figure 2: Transfort Redesigned Route Map Source: Cain



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