Accessibility Of The Boston Subway System for the Visually Impaired

Ian Perrault

University of Massachusetts Boston

Abstract

Accessibility of the Boston subway system is important, so that the visually impaired population can navigate around the city with ease and confidence. Accessibility includes such components as different kinds of automated announcements, appropriate assistance from MBTA staff to navigate the subway system's complex environment, bridgeplates to make boarding easier, schedules and other information in accessible formats, and other similar accommodations. This study will examine how the subway is currently accessible for this population, and will also examine how constructive improvements can be made in order to successfully reach the ideal goal of as close to 100 percent accessible as possible. This case study consists of valuable perspectives from both subway riders and from staff from within the MBTA's Department of Systemwide Accessibility. The findings indicate that stakeholders are satisfied with the progress in making the subway system more accessible for the visually impaired, but improvements are ongoing. More specifically, stakeholders are satisfied with the quality of automated announcements, with the implementation of the wayfinding orientation program at the Arlington Green Line Station, with the System Orientation training program, and with other key improvements. The goal is for the T to become a model that other transit systems can refer to, so that they also can be just as accessible for this population.

Table of Contents

Introduction and Research Questions

This case study will be critically evaluating, as well as analyzing, the amount of accessibility throughout the Boston subway system for the visually impaired. Over the years, accessibility has been an ongoing problem on public transportation systems. However, thanks to improvements in legislation, public awareness, and technology, this problem, while greatly lessened, does still exist within a variety of settings. Public transportation is a vital tool in our modern society, so that people are able to travel independently to complete daily tasks such as shopping, attending school, visiting family and friends, attending social events, and other similar activities. This is an important topic to thoroughly investigate, so that constructive improvements can be made. Once these improvements are successfully implemented, traveling for those with visual impairments will hopefully be as easy and as efficient as possible.

While this capstone primarily focuses on those with visual impairments, this research is also important in order to ensure that the playing field is level for everyone, including those with other permanent or temporary disabilities. Examples of accessibility features that are increasingly found throughout public transportation systems include elevators within terminals and stations, accessible walkways, automated or manual stop, destination, and transportation vehicle ID announcements, wheelchair ramps, wheelchair lifts, wheelchair securement areas, subway gap reducers, transit-related information in Braille, large print, audio, and in other accessible formats, appropriate assistance from terminal staff and transit vehicle operators, schedules and other transit-related documents in accessible formats, accessible fare media, an

effective Para transit system if the fixed-route system is not completely accessible, and other similar types of accessibility features, programs, and policies.

To successfully carry out this research, my research questions are: 1. Since the MBTA/Boston Center for Independent Living settlement agreement and the successful launching of the Department of Systemwide Accessibility, what steps have MBTA officials taken to ensure that the subway system has become more accessible for those with visual impairments? 2. What tasks are left to be done to ensure that the MBTA subway system becomes as close to 100 percent accessible for this population as possible? And finally, 3. what do passengers and MBTA employees within the Department of Systemwide Accessibility think of the progress that the subway system has made in this area, and what improvements do they believe are necessary in order to ensure that the subway system reaches its ideal goal of as close to 100 percent accessible as possible?

Prior to answering these research questions, a brief historical perspective regarding accessibility in general, as well as about transportation in particular will be presented, as well as a comprehensive literature review of previous research that has been completed in the field of accessible public transportation. It is not only beneficial to answer these specific research questions, but it is also essential to be aware of previous scholarly research that has been written about this subject in general, and about public transportation as it relates to the visually impaired population in particular. Specifically, this literature review focuses on different components of accessibility, as they are relevant to public transportation throughout the world.

Following the literature review, a detailed explanation of the data collection methods is presented, followed by the findings from the data collection, a discussion of the findings and

various recommendations for further improvements to the subway system, and a conclusion which summarizes the entire study.

The main objective of this study is to increase public awareness even further about the need for a fully accessible subway system for those with visual impairments, both for visitors and for those who reside in the greater Boston area. The other benefit of this study is to stress the importance of considering accessibility both when first constructing public transportation systems, and when implementing new programs and services throughout existing public transportation systems. In this way, the disabled population will be able to become as independent as possible much faster, and will have many more transportation optionsat their disposal.

Historical Background and Context

The historical background of accessibility in America in general, as well as of the accessibility of public transportation in particular, is important to consider when discussing this topic. One major theme that is relevant to accessibility is the laws and rights that have fortunately been established, which have made the lives for people with disabilities much easier and more meaningful. Examples of pieces of legislation include The Architectural Barriers of 1968 Act, the Urban Mass Transit Act of 1970, the Rehabilitation Act of 1973, the Air Carriers Access Act of 1986, and the Americans with Disabilities Act of 1990 (ADA), (Cavinato & Cuckoyich, 1992). Because of the above pieces of legislation, accessibility for all walks of life have gotten much easier. More specifically, when discussing the use of public transportation, while the other laws are important, the ADA is the most comprehensive piece of legislation, because it ensures that public transportation vehicles, centers, terminals, stops, stations, and other

facilities that are operated by public, fixed-route systems are accessible for people with all disabilities. Additionally, companies that operate transportation systems that are specifically designed for tourists fall under the provisions of the ADA, therefore they also need to be accessible.

Similar to the above pieces of legislation, the wrights that have been successfully established for people with disabilities is another component of this theme. Like the above laws, these are also important because traveling is a right that humans throughout society possess, and therefore, these rights should be no different for people with disabilities. Different from the above perspectives about the various disability laws, authors Fleischer and Zames focus on disability rights and the court system. For example, while the Civil Rights movement plays a major role in preventing discrimination, the public sometimes views the term "disability" from the impairment model, rather than from the civil rights model (Fleischer and Zames, 2005).

These scholarly articles also state that the impairment model says that if the particular disability is not successfully cured, equality is not the expected result (Fleischer and Zames, 2005). The authors are stressing that the Civil Rights movement is more based on adapting certain environments in order to accommodate individuals with a variety of disabilities, rather than assuming that environments that are already constructed are not accessible. With this positive mindset, equality can be successfully maintained, and members of the disability community can be successfully mainstreamed into society (Fleischer & Zames, 2005).

In addition to the historical background of accessibility in general, it is also beneficial to discuss the current historical perspectives of accessibility when constructing public transportation systems. More specifically, the Federal Transportation Administration, (FTA) is

the chief authority when overseeing accessibility throughout public transportation systems in the United States. According to the FTA, "most transit systems across the nation are fully accessible. For example, all new fixed route buses must have wheelchair lifts or ramps; new rail stations must have elevators or ramps, if necessary, for use by people with disabilities. Some older pre-ADA rail stations will not be fully accessible, because of their age. Those systems must follow the "key station" requirements in the appropriate transportation regulations" ("ADA Regulations"). The regulations say that when new transportation vehicles are purchased, and when new rail stations are constructed, they must be completely accessible for people with disabilities.

One more aspect of accessibility from a historical perspective is the MBTA's history of accessibility. In April of 2006, the Boston Center for Independent Living (BCIL) confronted the transit agency, because the organization was increasingly concerned that the transit system was not fully accessible for people with disabilities ("MBTA/BCIL Settlement Agreement"). Other disability organizations, as well as people with a variety of disabilities not associated with disability organizations, had similar feelings, and therefore, were also concerned about the lack of accessibility. To successfully address the various concerns about this important issue, in 2007, the Department of Systemwide Accessibility, SWA, was formed within the transit agency, to oversee improvements to the fixed-route system and to implement accessibility programs and policies that are currently in effect system wide. ("The Department of System-Wide Accessibility").

Examples of accessibility-related programs and policies that have been implemented because of these two initiatives include increased sensitivity training for MBTA staff, an internal monitoring program where observers act as undercover passengers in order to ensure that vehicle

operators are assisting passengers appropriately, more low-floor buses and low-floor light rail vehicles, schedules and other information in accessible formats, improvements to the accessibility of the MBTA's web site, and other similar accessibility-related programs and policies. Because of the above programs and improvements, the subway has gone a long way in becoming more accessible, however, progress still needs to be made to ensure that the subway system is as close to 100 percent accessible as possible.

Literature Review

A: Overview

An extensive amount of scholarly research has been previously conducted on accessible public transportation for people with a variety of disabilities. This literature review analyzes this previous research, and examines this topic from a variety of perspectives. While this research is important, more still needs to be executed to further public awareness about this subject. While a great deal of research on disabilities in general does exist, more emphasis should be placed on certain disabilities, to raise public awareness about how to successfully accommodate various populations. Once a larger variety of stakeholders become more knowledgeable about the barriers that exist for those with specific disabilities, officials that construct new public transportation systems can refer to this research, to ensure that their systems are beneficial to their stakeholders who happen to have a disability. The various articles have different ideas and perspectives when addressing this complex issue, however there is one perspective that the articles share in common: accessible public transportation is an ongoing problem, and by conducting more research, it can become even less of a burden for various disability populations.

The themes within the literature review include the barriers that people with cognitive disabilities and those with visual impairments face when confronting the complex environments that are associated with utilizing public transportation, accessibility both within transportation terminals and at bus stops, mobility for the disabled specifically for recreational and leisure purposes, and disabled and nondisabled public transportation usage patterns in a variety of situations. Each theme brings a unique perspective, and by considering all of the perspectives, hopefully more transportation systems will become accessible for a greater variety of disability populations.

B: Disability Barriers

An extensive amount of scholarly research has been conducted that focuses on the barriers that are encountered by those with various disabilities. While some stakeholders believe that the Americans with Disabilities Act is a civil right that has greatly assisted in making life easier for the disabled, some others believe that it is a bureaucratic mindset that is rigid and limits creativity when constructing buildings and other environments (Gray, Gould, & Bickenbach, 2003). Additionally, these pieces of scholarly literature say that a number of studies were completed, to assess the barriers that people with various disabilities face when attempting to access buildings and other environments. More specifically, to execute these studies, focus groups were formed that consisted of people with various disabilities, their significant others, healthcare professionals, and environmental professionals. The ultimate purpose of these focus groups was to allow a greater number of stakeholders to learn more about building access, and how those with different disabilities believe that buildings and other environments should be constructed.

As a result of holding these focus groups, they encouraged extensive collaboration among stakeholders, and less reliance on the ADA. By hearing from the effected parties themselves, environmentalists are able to become aware of the barriers that these populations encounter on a daily basis, and therefore, can listen to their constructive suggestions, concerns, and recommendations when new environments are successfully constructed. This perspective can relate to public transportation terminals, vehicles, and other facilities as well, because while the ADA has many building codes with which to comply, people with disabilities are the ultimate teachers who can provide valuable feedback and recommendations so that transportation agencies can successfully become more accessible.

While the above sections of literature discuss disability-related laws, civil rights, and disability barriers, these themes can all be pertinent when evaluating, as well as when advocating for, accessible public transportation. For example, the ADA protects disabled individuals, along with their civil rights, in all federally funded programs and services including public transportation (Fleischer & Zames, 2005). Additionally, to successfully implement the above laws, and to ensure that the civil rights for people with disabilities are not violated, there have been many problems within the courts regarding people with disabilities. Specifically, the most significant law that is challenging within the courts, but that is also relevant to ensuring that public transportation is accessible to the disability population, is Section 504 of the Rehabilitation Act of 1973. This piece of legislation was the first civil rights law for people with disabilities, and it was the final section to be added to this piece of legislation by both Democrats and Republicans.

Prior to the successful implementation of this law, frequent battles between consumers and organizations took place, because there were conflicts about what was, and what was not,

considered to be "reasonable accommodations." For example, the American Public Transportation Association, APTA, argues that providing reasonable accommodations is not possible, accessible public transportation provides the service for a minority group, and if public transportation systems were not built to be accessible, they cannot become accessible after being constructed. Additionally, these pieces of literature claim that victories began to occur as a result of Section 504 court cases. For example, rather than rebuilding existing transit vehicles to ensure that they are accessible for the disability community, the alternative that was set by the court is that when new vehicles are built, they should be accessible from the start, rather than after they are constructed. Because of these laws, civil rights, and barriers working together, life has become much easier and more meaningful for people with disabilities when utilizing public transportation on a daily basis.

 C: The Cognitive Disability Population

While analyzing the obstacles that the disabled face when encountering public transportation is essential for people with all disabilities, a few disability populations are unique when researching this topic, as well as when brainstorming ideas for improvements to public transportation systems. One of these populations is those who possess cognitive disabilities. Examples of symptoms include brain injuries, orientation skills, remembering pieces of information, organizational skills, and other life activities (Rosenkvist, Risser, Iwarsson, Wendel, Stahl, 2009). An important difference between cognitive disabilities and other disabilities is that the majority of other disabilities have a set limitation, as well as set ways to overcome that limitation. In contrast, cognitive disabilities can have many conditions and limitations, as well as a greater variety of ways to successfully overcome them. To further examine the barriers that those with cognitive disabilities encounter, various studies have been conducted.

The main objective of these studies was to examine the reasons that people with cognitive disabilities avoid public transportation. Upon completion of these studies, the main finding was that this population typically becomes familiar with their preferred method of transportation; therefore they are more reluctant to use public transportation for their daily travel needs.

While the majority of studies revealed the above finding, some of these studies did reveal a finding that was slightly different. More specifically, one of the studies took place in Sweden, and despite the above finding, the public transportation system in Sweden is universal, therefore it meets the needs of all user populations, regardless of disability. Because of this positive benefit, the cognitive disability population is more willing to utilize Sweden's public transportation system for their daily travel needs. The system consists of trunk route traffic for commuters, service route traffic which is utilized by the elderly and the disabled because of the higher quality of service from drivers, and a special door-to-door service exclusively for the disability community.

In addition to various studies being conducted, evaluating different technologies has been considered as well. Various articles discuss this initiative, and Gerhard Fischer and James F. Sullivan discuss how these technologies would benefit stakeholders with this disability. While it sounds promising, "this project faces two unique challenges: (1) is that there are no true "experts" who fully comprehend all facets of public transportation system design, operation, and maintenance; and (2) each person with a cognitive disability represents a "universe of one," preventing the technology designer from thinking in terms of typical "user classes" (Fisher & Sullivan, 2002). Additionally, another drawback to this project is that the design team must include members from diverse communities, as well as experts in the fields of public transportation and in adaptive technologies.

The purpose of this project is to allow those with cognitive disabilities to utilize mainstream public transportation systems, so that they can more easily integrate themselves into society. While Para transit services are often available, advanced reservations are usually required, this method is usually more expensive, users cannot be as flexible when utilizing this transportation option, and using Para transit separates users from the mainstream of society. To successfully accomplish this project, transportation officials and adaptive technology specialists tried out a variety of adaptive technologies, to determine which would work best for the cognitive disability population. Once the cognitive disability issues were identified, adaptive technology prototypes were designed and tested. In addition to designing these adaptive technology prototypes, field testing was also conducted, trying these prototypes within five major US cities: Milwaukee, Denver, Chicago, Tokyo, and Washington, DC. As a result of these tests, people with cognitive disabilities found these technologies beneficial, so hopefully they will find it easier and less nerve-wracking to utilize public transportation within their respective communities.

D: The Visually Impaired Disability Population

Another specialized disability population that is unique when researching and evaluating public transportation accessibility is those with visual impairments. Different from the cognitive disability population above, this group does not need as many physical adjustments, but rather, more accessible information while traveling. One piece of scholarly literature consists of a survey that was conducted in California which addressed the travel obstacles that were most difficult, as well as the travel obstacles that were most helpful, for this population.

As a result of this survey, to ensure that the visually impaired are able to successfully travel independently, many components and/or services need to be present while traveling. Examples of crucial pieces of information include timetables in alternative formats, larger signs on transit vehicles for easier route identification, information at transit centers and stops about a vehicle's real-time status, clearer automated and manual announcements both on transit vehicles and throughout terminals and stations, audible signs and information, accessible apps, tactile transit maps, accessible web sites, and transit telephone lines with operators (R. Golledge, C. M. Costanzo, and J. Marston, 1996). Once this survey was completed, results indicated that this population believes strongly that implementing the above accessibility policies would greatly assist them in becoming more confident and independent when traveling on public transportation. More specifically, survey participants said that audio messages should mimic the many visual messages that are located throughout terminals and that are on transit vehicles so that all users will get the same information at the same time.

Another obstacle that was mentioned was that transit information is not always easy to obtain, but survey results indicated that users appreciated that bus drivers usually notified them about upcoming bus stops and transfer points. Another obstacle that survey respondents' mentioned was that seats that are exclusively for the disability population were sometimes not available. To hinder the above obstacles, implementation of accessibility policies, as well as stricter enforcement of these and of mandated ADA policies, should be implemented by transportation agencies.

Another perspective about this population, that is essential when analyzing how they utilize public transportation, is obtaining the necessary confidence to carry out this daily task. Jake Feinberg, a teacher at the Arizona State School For the Deaf and the Blind in Phoenix, AZ,

discusses his experience when teaching students how to get to and from work during his internship at the Perkins School for the Blind in Watertown, MA. When Feinberg was teaching in Arizona, he usually took his students to their jobs by the school's van. However, during his summer internship at Perkins, he noticed that the Perkins students used public transportation, which gave him a unique perspective on this important life skill. Additionally, because of the importance of mastering this life skill, Feinberg says that he hoped to use this model back in Arizona, so that students will not only get the experience of the job itself, but just as important, they will also get a much more meaningful experience of getting to and from work. The Components of this skill that were taught included organization, self-advocacy, directionality, motivation, safety, and involvement.

According to Feinberg, the organizational component consisted of teaching the students which buses to take, knowing the number of stops that passed prior to their respective stop, knowing how to walk to the bus stop and how to walk to work after reaching their final destination,, transferring between buses, and other similar skills. This component also taught such tasks as ensuring that students had the correct bus pass or exact change, as well as ensuring that they knew how to keep track of time so that they would arrive at the bus stop on time. The self-advocacy aspect taught students to ask appropriate questions to bus drivers and the public, and how to obtain other types of similar assistance so that they could successfully complete their commute. Feinberg says that the directionality component was meaningful, because prior to taking public transportation to their workplace, students paid little or no attention to the direction that they were traveling. This taught them the importance of knowing cardinal directions, which in turn, increased their overall self-confidence. Feinberg says that motivation was also an important aspect of mastering this life skill. To successfully reinforce this component, he would

tell students that their sighted peers take the bus to work, and knowing that they were traveling the same way as the majority of the public, Feinberg says that this increased their confidence to successfully become integrated into their community.

Another way that Feinberg encouraged his students to try this new transportation option was that games were often played during travel, for example students would see who would be the first one to identify different sounds at bus stops so that they would know their location. In regard to safety, Feinberg taught his students how to safely cross streets, especially when transferring between buses. He says that the trip involved crossing a very difficult intersection, so this not only taught his students how to transfer between buses, but also taught them how to cross streets independently or by seeking out appropriate assistance. Finally, involvement was a crucial component to ensure that students could take public transportation successfully to and from work. By getting the student's entire educational program involved in this process, orientation and mobility lessons could be held at the same time that the bus trip was taking place, in order to provide increased reinforcement for the skills that were taught on a daily basis.

E: Disability Lifestyle

Within this final section of the literature review, there are four subsections: the inaccessibility of transportation terminals and of bus stops, being aware of how public transportation is used by the disabled population specifically for recreational and leisure purposes, the obstacles that users with different disabilities face while traveling on public transportation systems, and disabled and nondisabled usage patterns. These are all pertinent to a user's lifestyle, and therefore, are essential themes when discussing and analyzing this subject. Since these themes are all relevant to evaluating the accessibility of public transportation systems

it is essential to analyze them together, in order to gain a valuable perspective on how these topics, combined, play a role in improving lives for the disability community.

E1: The Accessibility of Transportation Terminals and Bus Stops

The accessibility of public transportation terminals and bus stops is one of the most important issues when analyzing this subject. To analyze this crucial issue, two matters that are important include legislation and standards for universal design. With this mindset in place, transportation centers are able to be accessible for all, regardless of disability. The objectives include evaluating the accessibility as the disabled person approaches the transportation center, evaluating barriers within the terminal itself, and suggesting improvements to make the experience more meaningful (Soltani, Sham, Awang, Rostam, & Yaman, 2012). To successfully analyze this crucial issue, it is believed that dividing the disabled into several sub groups is an effective analytical tool, in order to make brainstorming how to overcome the various obstacles indicated above easier and more efficient. These groups include ambulant disabled, wheelchair disabled, sensory disabled, and temporarily disabled.

Similar to the obstacles of ensuring that public transportation terminals are accessible, another obstacle that is just as crucial to overcome is the accessibility of bus stops because all, or the majority of them along fixed-route systems that are maintained by transportation agencies are not ADA compliant. There is a multiobjective binary nonlinear programming model that addresses this complex issue. More specifically, this model consists of two objectives: to ensure that transit agencies meet the minimum accessibility standard for bus stops, which is defined by the ADA, and to ensure that bus stops that are accessible will benefit the most number of riders.

Since transit agencies have a limited budget, it is impossible to ensure that every bus stop in the system is ADA compliant. Despite this fact, some transit agencies even attempt to make their bus stops accessible by meeting the standard for Universal Design, which goes beyond the minimum standard that the ADA requires. More specifically, in 2005, Easter Seals Project Action, a transportation advocacy organization, implemented this standard for universal design, which would benefit all riders (Wu, Gan, Cevallos, & Hadi, 2009). A major benefit of this standard for universal design is that it is not only for riders with disabilities, but it also benefits the elderly, children, parents pushing strollers, and other populations. Additionally, other benefits of this universal design standard include that it requires bus shelters, lights, benches, route maps, and schedules. Therefore, the number of amenities at bus stops increases dramatically when this standard is implemented by transit agencies. Additionally, the Universal Design Standard suggests that since shelters are inspected, they are also maintained on a regular basis, as compared to the ADA standard, which does not require this protocol.

While this multidimensional model has two main objectives, the major purpose of this model is to brainstorm ideas, and to implement programs and policies across transportation agencies where both the Universal Design standard and the minimum ADA accessibility requirements can be implemented at bus stops.

Since many transit agencies do not have sufficient funding to successfully implement the Universal Design standard, the alternative is the minimum accessibility standard as outlined by the ADA. Because of this protocol, transit agencies still can be considered accessible for the majority of their riders, even though some riders cannot access their individual bus stops. The minimum accessibility standard for bus stops, defined by the ADA, includes components such as accessible sidewalks, curb cuts at the ends of sidewalks, and loading pads. One of the ways that

this issue was successfully addressed was that a study was completed in 2006 that analyzed the bus stops for the transit agency in Broward County, Florida. Upon completion of the study, it was determined that even though the ADA has regulations to ensure that bus stops are accessible, many bus stops are still, in fact, not accessible for some of their riders. According to this study, in 2006, only 51 percent of bus stops throughout this transit agency met the ADA standard. Therefore, because of this low percentage of accessible bus stops, either the ADA needs to be more strict about its regulations for accessible bus stops, or more funding needs to be provided to transportation agencies to implement the Universal Design standard at their bus stops.

E2: Navigating Public Transportation Systems For Recreational and for Leisure Purposes

A major benefit of public transportation is that one can take advantage of all of the leisure activities that communities have to offer. Because of this major benefit, becoming aware of how the disabled utilize public transportation for both recreational and leisure purposes is yet another major component when discussing public transportation accessibility. To analyze this ongoing problem, there was a study that was based in Poland. Throughout this study, 350 disabled people were interviewed, as well as 150 nondisabled people. Both groups were from the same households, and the results of the study indicated that the disabled visited family and friends more often. In contrast, the nondisabled participated in more physical activities, especially sports (Taylor & Józefowicz, 2012). Additionally, the literature claims that normal mobility could be a reason that the disabled community does not participate as much in physical activities, and that they may feel at a disadvantage over their nondisabled counterparts when navigating around unfamiliar environments.

E3: Navigating Public Transportation Systems

Similar to the obstacles that are associated with navigating public transportation terminals and ensuring that bus stops are either ADA accessible or meet the Universal Design standard for accessibility, it is also beneficial to analyze the obstacles that the disabled population face while taking journeys on public transportation itself. A great deal of scholarly literature discusses these issues, using London's extensive public transportation network as an effective model. This extensive public transportation network consists of seven separate transportation modes, with many routes within each mode. More specifically, these modes include the Tube, which is the subway system that operates primarily underground, the Overground and the Docklands Light Railway, which both primarily operate above ground, trams, boats, buses, and suburban and intercity rail services (Ferrariab, Berlinjeriob, Calabrese, & Readesc, 2013). In 2006, Transport for London, (TFL), the operator of this extensive public transportation network, had a master plan that would have half of the Tube's stations accessible by 2010, and a third of them accessible by 2013.

However, because of both internal and external obstacles such as financial resources, the Olympics, and to ensure compliance with the Disability Discrimination Act (DDA), prioritizing improvements and upgrades to stations has been difficult to successfully carry out. As a result of these accessibility constraints, it is believed by multiple stakeholders that Transport for London should brainstorm an alternative accessibility plan, so that while the disabled population would not be able to navigate the entire transit system, ensuring that stations that have a great amount of traffic are accessible is beneficial to ensure access for the most number of disabled riders.

This plan would also be beneficial if the disabled travel routes that are less popular for the general public. A drawback to this plan is that the disabled population is most likely to experience longer travel times to successfully reach their destination than the nondisabled. With this alternative plan, the literature claims that it would make up for the lack of accessibility at different stations that the nondisabled can utilize with ease. However, even if this plan is successfully implemented, because London's extensive transportation network is obsolete, the wheelchair user population would still stand out more than other disability populations when analyzing how to effectively travel on this public transportation network. More specifically, for disabled users in general, and for wheelchair users in particular, frequent transfers between vehicles and between transportation modes are much more likely than for the nondisabled, because not all stations are accessible for all disabilities.

E4: Disabled and Nondisabled Public Transportation Usage Patterns

Another component to consider when discussing this topic is the travel patterns of the disabled, as well as of the nondisabled. According to the literature, there is not a great deal of research that has been conducted about disabled and nondisabled travel patterns (Wheeler, Yang, Xiang, 2009). However, the literature does discuss data from the 2002 US Census, which was utilized to make comparisons of children who were age 17 and older, and who did, and who did not, have disabilities. To be in the group that had a disability, the criteria included deciding whether the children successfully answered disability-related questions, whether or not they had special education, and whether or not they met the provisions of the ADA. Within this study, the variables included gender, age, race, days leaving home, household income, and availability of transportation. Generally, more of the disabled population claimed that they have trouble obtaining needed transportation. Additionally, the literature claims that between both groups,

medical and long-distance transportation did not change, and the disabled utilized school buses more than the nondisabled. However, thanks to the ADA, to accessible fixed-route public transportation systems, and to Parra transit services, it has become easier for the disabled to become more confident, as well as more independent, so that they can integrate themselves successfully into society.

One more perspective to consider when evaluating travel patterns for different populations is the difference between travel patterns for older adults, for people with low incomes, and for the general disabled population. To analyze this subject, a case study and surveys were referenced in Cache County, Utah. More specifically, within this study and the surveys, the dimensions that were considered included travel characteristics, the accessibility of public transportation, and the amount of travel assistance that was acquired from social networks, such as from family and friends. When the studies and the surveys were completed, results showed that older adults and those with low incomes utilized more private vehicles, or relied on their social networks for transportation (Jansuwan, Christensen, & Chen, 2013).

In contrast, the disabled population was found to take advantage of public transportation more frequently, as well as travel to and from work on a frequent basis. Additionally, throughout this particular community, this population had trouble accessing public transportation, because of the long walk from residences. According to the literature, because of these findings, there are relationships that can be revealed between transportation modes and social networks. More specifically, they say that those with a larger social network are more likely to receive more assistance with their transportation needs, whereas those with smaller social connections had to rely more on public transportation.

Methods of Data Collection and Analysis

To successfully collect relevant data to evaluate the MBTA subway system's present amount of accessibility for the visually impaired, as well as to receive constructive suggestions for relevant improvements, qualitative data will be the primary data collection method that will be utilized. More specifically, several interviews will be conducted, either by e-mail or by telephone, to obtain a variety of perspectives regarding this complex issue. Once these opinions and perspectives are successfully received, the data can be successfully analyzed by evaluating any perspectives that occur repeatedly, or perspectives that may occur as they relate to either positive or negative aspects of accessibility throughout the subway system. There are two types of interviews: one will be geared toward MBTA passengers with visual impairments, and the other will be geared toward staff within the Department of Systemwide Accessibility. To successfully recruit my subjects, the subjects will be contacted via e-mail, and if they do not answer within a timely manner, the subjects will be contacted via telephone.

In order to ensure that the interviews are as meaningful as possible, two topic guides are provided in the appendix section. Within the topic guides, there are approximately 10 interview questions for each group. If the interviews will be completed via e-mail, the answers will be easily accessible either in Microsoft Word or on my Braille Note. Since I primarily use both of these technologies, the answers will be easy to keep confidential. However, if the interviews are conducted by telephone, they will be recorded, using the Voice Memos app on the I Phone, so that the answers will be easily accessible when analyzing the data. To ensure that the telephone interviews remain as confidential as possible, the files will be transferred from the voice memos to the computer. Additionally, the interviews will be password protected, that way their access will be limited.

Findings from Data Collection and Analysis

Following the successful completion of the 9 interviews of MBTA passengers and of the one interview of a staff member within the MBTA's Department of Systemwide Accessibility, I found out both positive aspects of the subway system and suggested improvements from both passengers and staff. While the subway system is currently not completely accessible, passengers, for the most part, find it a valuable transportation mode, and the overall reaction to most of its accessibility features is positive. Some subjects utilize the T on a daily basis, while some utilize it less frequently. The subjects travel to work, school, and to social events, and all of their perspectives play a crucial role in further defining how accessibility plays a role in public transportation.

MBTA Passenger Perspectives

When interviewing MBTA passengers with visual impairments who use the subway system, I found that they have many different perspectives about this transportation mode of the MBTA's fixed-route system. In general, these perspectives are important when determining which direction T officials should lead the agency, in order to ensure that the T reaches its ideal goal of as close to 100 percent accessible as possible. Common themes among the subjects include automated announcements, customer assistance, legal blindness, system orientation, and other accessibility features.

Automated Announcements

Relevant to automated announcements, the majority of the subjects find this a useful aspect of accessibility when navigating the subway system. For example, one of the subjects came from New York City, was already an experienced subway rider, and uses the subway on a

daily basis. However, upon moving to Boston, this subject said "the added supports found here assisted me greatly in my transitioning to the newer system once I relocated." This subject, along with several of the other case study participants, favor not only automated stop announcements, but also automated announcements on platforms notifying passengers that trains are approaching and arriving. While the subjects appreciate this essential tool, they believe that the different kinds of automated announcements can be improved. Additionally, besides automated stop and train arrival announcements, one subject suggests that the color of the line and the destination be announced while the train is at the station on a more consistent basis. With this feature implemented consistently, stakeholders would know the train that they are boarding while they are on the platform every time, rather than having to rely on other passengers for clarification.

According to this subject, this feature is possible, because the subway systems in New York City and in San Francisco have this protocol already. Compared to most subway systems, one interviewee also finds it beneficial that T staff notify passengers what side the doors will open on at each station, which makes orienting to their surroundings much easier. While most study participants find this feature helpful, one subject says that there should be more training for drivers to ensure that they make manual announcements if the automated systems are not working, as well as more training to ensure that the automated announcement systems on trains work as close to 100 percent of the time as possible.

Customer Assistance

Another theme that emerged from the interviews is assistance from T staff and from fellow passengers to navigate the subway system's complex environment. Some of the interviewees take advantage of either one or both types of assistance regularly, others use them when needed, and some case study participants do not use any means of assistance at all, other

than their mobility devices. For example, one stakeholder does not usually use the assistance from MBTA staff to successfully navigate the subway system's complex environment, but this participant does find it useful when in a rush to reach a particular destination. In contrast, in one instance, another subject used the assistance from MBTA staff to independently travel from Kenmore Station to a restaurant in the station's vicinity, which permits this subject to be more spontaneous when making travel arrangements.

In addition to utilizing MBTA staff for help, this subject, along with others, rely on fellow passengers should T staff not be available. One subject said that T staff are available 95 percent of the time, and they always ensure that this participant arrives at their destination safely and on time. Because of receiving both kinds of assistance, one subject said that they have learned more about the layout of subway stations, as well as about the layout of streets around the Boston area. With this extensive amount of assistance, many of the participants have more confidence to ride the subway independently. One subject suggests that if the layout of all subway stations are the same, the need for assistance to navigate would be greatly mitigated.

Legal Blindness

Two of the subjects who were interviewed are legally blind. One of these subjects rides the subway approximately four times a month, and the other rides between four and six times a month. Similar to the other study participants, there confidence level has increased to be a more independent traveler. This subject says that their confidence level to ride the subway system increased because of accommodating passengers, access to handrails, and working elevators and escalators." Because this subject is legally blind, they find open spaces, tactile pathways, and large print on signs helpful. Additionally, according to this participant, bricks should be removed

on pathways in general, but in the area of the Harvard Square subway station in particular. These participants believe that there should be more accessible signage throughout the subway system. More specifically,, one interviewee believes that the signage at Downtown Crossing after going through the turnstile is difficult to read so it is difficult to know exactly where to go.

Additionally, this subject believes that it is difficult to figure out cardinal directions, which makes orienting difficult. To overcome the above challenges, this subject usually asks fellow passengers for assistance, since this participant often gets turned around when exiting stations. The other subject who is legally blind has a similar perspective, and insists that the system orientation program, which will be discussed below, should be customized for those who are both totally blind and legally blind.

One study participant who is legally blind, but who is also partially deaf, takes advantage of the subway system daily in the afternoon and in the evening, especially in the warm weather. This subject travels to Watertown, Somerville, and to other locations around the Boston area. Different from the other legally blind participants, the captioning assists them as well in navigating the system. Related to improvements, this interviewee believes that all cars on the Red, Orange, and Green Lines should have both working automated announcements and overhead captioning. This subject says that currently, it is luck of the draw what car one gets on, so this subject believes that in order to keep the system consistent, all cars should have these services.

System Orientation

MBTA officials have made significant investments in the tools that passengers with visual impairments utilize to successfully become oriented to the subway system's complex environment. Two of these services include the System Orientation Training Program and the

Wayfinding orientation program. Most of the case study participants find both of these programs extremely helpful, and their confidence level has increased when taking advantage of these programs. The system orientation training program teaches new riders about the advantages of using public transportation, the accessibility features that are available throughout the subway system, how to read schedules and other information, how to request appropriate assistance during journeys, and other essential transportation-related skills. Specifically, one subject said that after observing the program, they found it to be a valuable tool, and they hope that this program will reach more stakeholders in the future. Additionally, after participating in the program, this subject uses the door-to-door service much less, because they feel more confident to be more spontaneous in their travels. A suggestion to improve this program is that emphasis should also be placed on transferring between transportation modes, for example between subway and bus.

Similar to the System Orientation training program, the wayfinding orientation program is a service that has recently been implemented at the Arlington station on the Green Line. Using a smart phone, participants can listen to verbal directions and they are able to be guided to platforms and exits throughout the subway station. Several of the study participants tested this program, and found it to be a tool which significantly reduces the need for staff and passenger assistance during travel. These study participants say that they hope that eventually, the T will roll out this program to all stations throughout the subway system. Specifically, one subject suggests that instead of having this service only available on smart phones, it should be used on devices similar to those used for museum tours, since many stakeholders do not own smart phones.

Other Accessibility Features

The final theme that emerged from the passenger interviews is other accessibility features, including the MBTA's web site and the variety of smart phone applications that are currently available. The majority of study participants believe that these tools are useful, so that they can plan their trips more independently. Additionally, some subjects appreciate that schedules are accessible with screen readers on the MBTA's web site, which is uncommon among other transit agencies. Usually, schedules are in PDF format, but on the MBTA's web site, schedules are in standard HTML format, making them completely accessible with adaptive technologies.

Another feature that is unique to the T is the ability to obtain schedules in alternative formats, such as large print or Braille, should stakeholders not have computers or other adaptive technology. One subject appreciates that they can receive schedules and other information in Braille, so that they can plan their trips more efficiently. Some smart phone applications that the participants find useful include Catch the Bus, which gives real-time arrivals at bus stops, and the official MBTA Commuter Rail application.

MBTA Department of Systemwide Accessibility Perspectives

In addition to obtaining valuable perspectives from MBTA passengers, it is also essential to learn the perspectives of the staff that oversee the great accessibility programs and policies that are currently in effect system wide. When one of the staff members in this department was interviewed, it was discovered that the T has implemented many programs and policies since the office began operating in 2007. This subject has had many roles within this department, and is currently still employed there. While this individual has worked for this MBTA department, many significant programs to the subway system have been implemented to improve the user

experience for people with visual impairments. Similar to the above passenger perspectives, there are many themes that emerged from the interviews, and these themes discuss the areas where improvements should be made.

Construction Projects

According to this subject, many elements of the subway system are not accessible, because stations and the subway system's overall infrastructure are obsolete. For example, according to this subject, a policy is currently in place that requires all station construction projects to be reviewed by the office prior to implementation, to ensure that they comply with appropriate accessibility standards. Additionally, this participant says that the Plan for Accessible Transit Infrastructure, or (PATI), which is another positive step in the right direction, aims to survey all subway stations to check the barriers that exist to prevent accessibility. This subject says that to ensure that all subway stations are 100 percent accessible, the infrastructure will be upgraded at each station, and more tactile warning strips will be installed on station platforms." The development of a prioritization formula also is a part of this plan, to brainstorm which stations need to be made accessible sooner, rather than later, based on the number of riders that utilize them."

System Orientation

System orientation has been a key area within the department of Systemwide Accessibility, to ensure that those with visual impairments are able to easily ride the subway with ease and confidence. For example, this participant says that the office developed a system orientation training program, which gives new riders a general overview of how the subway system works. Additionally, the

program also teaches riders how to access schedule information, how to receive assistance during journeys, safety information, and other travel-related skills. This subject says that once participants take part in the general system orientation training program, individualized travel training is available, to assist those to get to and from specific destinations throughout the subway system's service area. Additionally, this interviewee says that the T is looking further into the wayfinding technology that the passenger subjects find helpful. Similar to the passengers, this subject agrees that with this technology, indoor navigation throughout subway stations will become much easier for those with visual impairments." To ensure that this indoor wayfinding system is present at all stations throughout the subway system, the study participant says that the office is working on a strategic plan to obtain the appropriate funding. In addition to funding, the interviewee says that the T will need community support, such as from the Access Advisory Committee and from the Boston Center for Independent Living (BCIL).

Key Programs and initiatives

According to this study participant, the programs that have been the most beneficial for those with visual impairments include the improved employee training program and the Internal Access Monitoring program. More specifically, relevant to the employee training program, this subject says that employees are now much more confident in assisting this population when navigating the subway system. For example, this interviewee says that employees are much more aware of how to give customers sighted guide if they request this service." In

terms of the Internal Access Monitoring program, employees now comprehend the importance of honoring all reasonable requests throughout the subway system, including deploying mobile bridgeplates at subway stations, and/or calling ahead to a customer's destination station so that they can receive appropriate assistance. According to this subject, because of the successful implementation of these and the other programs and policies, the amount of operators that are disciplined has decreased, which in turn, has resulted in a much more meaningful experience for the visually impaired population."

Discussion

The above findings indicate that the T subway has made substantial progress in becoming more accessible for the visually impaired, and passengers have become much more confident when navigating the system. They are able to travel around Boston for school, work, and for other purposes, with much more ease and confidence, thanks to the various programs and policies that are presently in place. However, because of the above findings, improvements should continue to ensure that the subway reaches its ideal goal of as close to 100 percent accessible as possible. The T should keep expanding the amount of automated announcement systems on its trains, it should continue to roll out the wayfinding orientation system throughout all of its stations, the system orientation training program should cover more areas, the T should put larger print on its signs and ensure that pathways are more even, and it needs to continue to train its staff on how to assist passengers appropriately. In addition to improvements to the subway system, the T would be a great model that other transit systems around the country and the world can utilize, for guidance in ensuring that their respective system is accessible for those

with visual impairments. Since most transit systems do not have the extensive amount of services like the T such as assistance from staff, a wayfinding orientation system, accessible web sites, a system orientation training program, and other critical services and policies, the T would be a great model, and if other transportation agencies follow in the T's footsteps, all transit systems would be ready and available for those with visual impairments to travel anywhere, anytime.

Conclusion

This study has evaluated the Boston subway system and its present amount of accessibility for the visually impaired, as well as gained valuable opinions from passengers and staff for suggested improvements that should be made to ensure that the subway system is as close to 100 percent accessible as possible. Because of the American Rehabilitation Act of 1973, the Americans with Disabilities Act of 1990, and other pieces of legislation, life for the disabled has gotten much easier. Throughout this study, it has been continuously emphasized, by both passengers and by MBTA staff, that the subway system has made substantial progress in meeting their ideal goal of as close to 100 percent accessible as possible. However, improvements are ongoing and more progress needs to be made to successfully meet this objective. Additionally, the above literature review has emphasized that while an extensive amount of scholarly research has been completed about public transportation and disabilities in general, more research needs to be completed regarding public transportation and those specifically with visual impairments, as well as with other disabilities, so that more public awareness can exist. Thanks to the ADA, the Federal Transportation Administration, and other pieces of legislation, most public transportation systems have improved their accessibility, but few take accessibility as seriously as the MBTA subway system. Thanks to the above data findings, it is easier to know where the T is doing well, as well as in what areas the T should improve. By implementing the above

improvements, as well as by receiving continuous feedback from stakeholders, the T will

become the global benchmark for accessible public transportation, and other public

transportation systems can refer to the T so that they can become just as accessible forthis

population.

References

Cavinato, J. L., & CUCKOYICH, M. L. (1992). Transportation and tourism for the disabled: an

assessment. Transportation Journal, 31(3), 46-53.

Feinberg, J. (2011). Becoming Commuters: Teaching Students Traveling to Work Using Public

Transportation. Journal of Visual Impairment & Blindness, 105(5), 262.

Ferrari, L., Berlinjeriob, M., Calabrese, F., & Readesc, J. (2013). Improving the accessibility of

urban transportation networks for people with disabilities. *Transportation Research Part*

C: Emerging Technologies.

Fischer, G., & Sullivan Jr, J. (2002). Human-centered public transportation systems for persons

with cognitive disabilities. In Proceedings of the Participatory design conference (pp.

194-198).

Fleischer, D. Z., & Zames, F. (2005). Disability Rights: The Overlooked Civil Rights Issue.

Disability Studies Quarterly, 25(4).

Golledge, R., Costanzo, C. M., & Marston, J. (1996). Public transit use by non-driving disabled

persons: *The case of the blind and vision impaired. California Partners for Advanced*

Transit and Highways (PATH).

Jansuwan, S., Christensen, K. M., & Chen, A. (2013). Assessing the transportation needs of low-

mobility individuals: Case study of a small urban community in Utah. *Journal of Urban*

Planning and Development, 139(2), 104-114.

MBTA/BCIL Settlement Agreement (UNITED STATES DISTRICT COURT FOR THE DISTRICT OF MASSACHUSETTS 06).

Rosenkvist, J., Risser, R., Iwarsson, S., Wendel, K., & Ståhl, A. (2009). The challenge of using public transport: Descriptions by people with cognitive functional limitations. Journal of Transport and Land Use, 2(1).

Soltani, S. H. K., Sham, M., Awang, M., & Yaman, R. (2012). Accessibility for Disabled in Public Transportation Terminal. Procedia-Social and Behavioral Sciences, 35, 89-96.

Taylor, Z., & Józefowicz, I. (2012). Intra-urban daily mobility of disabled people for recreational and leisure purposes. Journal of Transport Geography, 24, 155-172.

Wheeler, K., Yang, Y., & Xiang, H. (2009). Transportation use patterns of US children and teenagers with disabilities. Disability and health journal, 2(3), 158-164.

Wu, W., Gan, A., Cevallos, F., & Hadi, M. (2010). Multiobjective optimization model for prioritizing transit stops for ADA improvements. *Journal of Transportation Engineering, 137*(8), 580-588.

Appendix

Spring 2015 Capstone Project

Interview Consent Form 1: MBTA Passengers

Principal Investigator: Ian Perrault

Introduction

My name is Ian Perrault, and I am in the Master's in Public Administration graduate program at the University of Massachusetts, Boston. In order to successfully complete my capstone project, I am cordially inviting you to participate in a research study, to examine the accessibility of the Massachusetts Bay Transportation Authority subway system. The purpose of this research study is to first evaluate how those with visual impairments believe the subway system is accessible, as well as improvements that should be made. If you would like to participate in this study, I will be asking you approximately 10 questions about your experience riding the MBTA subway system, and I will also ask you to brainstorm improvements that you believe would make the subway system even more beneficial for this population. The interview should take between 30-60 minutes. The interview will be completed either by e-mail, or over the telephone. With your expressed permission, if the interview will be conducted by telephone, I will be recording it, so that I can refer to it later while analyzing the data. However, whether the

interview will be by e-mail or by telephone, I will be the only one who will have access to your answers, so the highest level of confidentiality will be strictly maintained.

To ensure that this level of security is maintained, the data file will be transferred on to my Braille Note, so no one will be able to access it, let alone read it! While analyzing the data, your name will not be mentioned anywhere in the report, and following the completion of this capstone, the file will be permanently deleted. If you choose to participate in this study, you can stop at any time, or end the interview at any time, and for any reason. Nothing will be taken against you, should you decide not to participate, or if you stop participating during the course of the interview.

There is no payment for your participation, nor is there a cost to participate.

If you have any questions or concerns about the above procedures, or about this capstone project in general, please do not hesitate to contact me at ian.perrault001@umb.edu. If you have questions about the procedures about how human subjects are protected in research projects, please contact the Institutional Review Board (IRB), located at the Office of Research Compliance, at 617-287-5374, or at human.subjects@umb.edu.

Thank you very much for your consideration to participate.

Ian Perrault

Spring 2015 Capstone Project

Interview Consent Form 2: MBTA Department of Systemwide

 Accessibility Staff

Principal Investigator: Ian Perrault

My name is Ian Perrault, and I am in the Master's in Public Administration graduate program at the University of Massachusetts, Boston. In order to successfully complete my capstone project, I am cordially inviting you to participate in a research study, to examine the role that the MBTA's Department of Systemwide Accessibility has played in ensuring that the subway system is as accessible as possible for those with visual impairments. The purpose of this research study is to first evaluate how those with visual impairments believe the subway system is accessible, as well as to brainstorm improvements that should be made. If you would like to participate in this study, I will be asking you approximately 10 questions about your experience working in the Department of Systemwide Accessibility, as well as the effectiveness of the various accessibility-related programs that have been implemented. The interview should take between 30-60 minutes. The interview will be completed either by e-mail, or over the telephone. With your expressed permission, if the interview will be conducted by telephone, I will be recording it, so that I can refer to it later while analyzing the data. However, whether the interview will be by e-mail or by phone, I will be the only one who will have access to your answers, so the highest level of confidentiality will be strictly maintained.

To ensure that this level of security is maintained, the data file will be transferred on to my Braille Note, so no one will be able to access it, let alone read it! While analyzing the data, your name will not be mentioned anywhere in the paper, and following the completion of this capstone, the file will be permanently deleted. If you choose to participate in this study, you can stop at any time, or end the interview at any time, and for any reason. Nothing will be taken

against you, should you decide not to participate, or if you stop participating during the course of the interview.

There is no payment for your participation, nor is there a cost to participate.

If you have any questions or concerns about the above procedures, or about this capstone project in general, please do not hesitate to contact me at ian.perrault001@umb.edu. If you have questions about the procedures about how human subjects are protected in research projects, please contact the Institutional Review Board (IRB), located at the Office of Research Compliance, at 617-287-5374, or at human.subjects@umb.edu.

Thank you very much for your consideration to participate.

Ian Perrault

MBTA Passenger Interview Questions:

1. How often do you ride the MBTA subway system?

2. Because of the increased amount of accessibility of the subway system, as your confidence increased to ride it independently? If so, please give some examples.

3. What parts of the subway system do you most appreciate as someone with a visual impairment?

4. What areas of the subway system do you believe that the MBTA could improve, based on having a visual impairment?

5. Where do you most frequently travel on the subway system?

6. In what ways do you receive assistance when navigating through the MBTA subway environment?

7. What times of the day do you usually ride the subway?

8. Do you use other modes of transportation, besides the subway? If so, when would you use those alternative methods? (The Ride, buses, Commuter rail, etc).

9. What part of accessibility most benefits you as someone with a visual impairment? (stop announcements, assistance from MBTA staff, bridgeplate, etc)

10. Do you have any additional comments or recommendations that could effect those with visual impairments to ensure that the subway is as accessible as possible?

MBTA Department of Systemwide Accessibility Interview Questions

1. How long have you worked in the Department of Systemwide Accessibility?

2. While working there, what programs and policies have been launched to increase the amount of accessibility on the MBTA subway system?

3. Which of these programs do you believe to be the most beneficial for those with visual impairments?

4. As the MBTA looks ahead in the future, what programs and policies do you believe can, or will, be implemented to ensure that the subway reaches the goal of 100 percent accessibility?

5. How will these programs be successfully implemented?

6. In general, because of the Department of Systemwide Accessibility, do you believe that this office plays a vital role when increasing the confidence of those with visual impairments to ride the subway independently? If so, specifically in what ways is this accomplished?