Perceptions of Public Transportation with a focus on Older Adults

THESIS

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By

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Abstract

Older adults of this age are generally very active and outgoing. However, as people get older, their senses and reflexes diminish, which makes it harder and dangerous for them to drive. This study focuses on the needs and expectations of older adults when using public transportation. I hope to encourage them to use this system; to help their self-confidence, maintain their independence and stay in their own homes and communities. This study took place in Columbus, Ohio. The only public transportation currently present is the COTA bus system (Central Ohio Transit Authority). Also, the targeted older adults are 65 years or older, independent, self-reliant and local citizens of Columbus city. The thesis contains a well-developed literature review following a chain of thoughts that leads to the proposed topic being studied. The study includes questionnaires and interviews conducted by older adults and others; professionals in the fields of gerontology or public transportation system. The end results are a series of common physical and conceptual problems on public transportation with possible some solutions. The final analysis is an improvement to the public bus system and an emphasis on the universal design concepts.
This document is dedicated to my mom, dad, grandma, and my family who offered me unconditional love; to my brother Jad for teaching me that any task can be accomplished one step at a time; and to my friends who were always there to support and encourage me throughout the course of this thesis. To each of the above: Thank you!
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# Table of Contents

Abstract ......................................................................................................................... ii

Dedication .................................................................................................................... iii

Acknowledgments ........................................................................................................ iv

Vita ............................................................................................................................... v

Fields of Study ............................................................................................................ vi

List of Figures .............................................................................................................. xi

CHAPTER 1: Introduction ............................................................................................. 1

Hypothesis ..................................................................................................................... 3

Definitions: ................................................................................................................... 7

Delimitations and Limitations of the Study .................................................................. 8

CHAPTER 2: Literature Review ..................................................................................... 10

Section 2.1: Universal Design ..................................................................................... 10

The Seven Principles of Universal Design .................................................................. 11

Section 2.2: Public Space ............................................................................................ 14

Environmental Psychology ......................................................................................... 14
Influence of Environment on Behavior .......................................................... 15

Applied Environmental Psychology ............................................................ 16

Designing for Experience ........................................................................... 16

Urban experiences ...................................................................................... 17

Public Space .................................................................................................. 19

Navigation ................................................................................................... 20

Environmental cognition of older adults ................................................... 26

Section 2.3: Older Adults ............................................................................ 28

Statistics, Pyramid ...................................................................................... 28

Patricia Moore ............................................................................................ 30

Old age effects ........................................................................................... 31

Elderly life phases ...................................................................................... 33

Social perspectives and theories on aging ................................................. 34

Social Isolation ........................................................................................... 38

Aging in place ............................................................................................. 40

Transportation for older Americans .......................................................... 43

Challenges of Driving ................................................................................. 47

Section 2.4: Daily Transportation ............................................................... 51

Public Transportation .................................................................................. 52
Benefits: .................................................................................................................. 112

Section 5.1: New Frame Work: ............................................................................... 112

Bibliography ........................................................................................................... 126

Universal Design ..................................................................................................... 126

Environnemntal Psychologie ..................................................................................... 129

Navigation ............................................................................................................... 134

Disability ................................................................................................................ 140

Older Adults ........................................................................................................... 144

Transportation ....................................................................................................... 148

Appendix A: Sample of Questionnaire ................................................................. 154

Appendix B: Sample Cards from Elderly Interview ............................................. 159
List of Figures

Figure 1: introduction: Total fertility rate and life expectancy at birth, world 1950-2050. 2
Figure 2: introduction: Frame work of the research from general to specific. ............... 4
Figure 3: introduction: The 3 tier which lead to the topic. ........................................... 6
Figure 4: literature review: Life expectancy at 65 and 85 years (Statistics, 2008). ........ 29
Figure 5: literature review: Fatal crash rate, fatalities per 100 Million Vehicle Miles of
  Travel, 2001 (Survey, 2006). ......................................................................................... 48
Figure 6: literature review: Average public transit trip characteristics nationwide by
  transit mode (Research, 2005). ...................................................................................... 54
Figure 7: literature review: History of Columbus in Transportation. ............................. 68
Figure 8: description of study: Name of the centers and their location on the map of
  Columbus. ...................................................................................................................... 74
Figure 9: questionnaire: Status, state, and daily transportation of older adults. ............ 79
Figure 10: questionnaire: Older adults, way-finders vs. way-followers.......................... 80
Figure 11: questionnaire: Trip planning. .......................................................................... 81
Figure 12: questionnaire: Older adults’ source of information when navigating. .......... 81
Figure 13: questionnaire: Usability of COTA by elderly participants............................. 82
Figure 14: questionnaire: Older adults’ evaluation of COTA bus stops........................... 82
Figure 15: questionnaire: Symbols of essential features deduced from questionnaire. .... 83
Figure 16: elderly interview: Design elements of bus stops ........................................ 84

Figure 17: elderly interview: Design of the system ............................................ 89

Figure 18: professional interview: Words used during the conversation with Linda Mauger ................................................................. 93

Figure 19: professional interview: Words used during the conversation with Scott Lissner ................................................................. 95

Figure 20: professional interview: Words used during the conversation with Edward Mcganis ................................................................. 98

Figure 21: professional interview: Words used during the conversation with Doug Moore. ................................................................. 100

Figure 22: summary: Visual representation of all studies .................................... 105

Figure 23: summary: The pathway of a journey ............................................. 106

Figure 24: summary: The COTA system ....................................................... 108
“We still have a long way to go … to capitalize on the potential of the second half of life, to reduce barriers to personal self-fulfillment, to ease the social and physical isolation that so often plagues older adults, and to shift from a negative view of aging to one based on the positive realities.” (Cohen, 2006)

By 2050, there will be an immense increase of adults aged 65 and above (Aging A. o., 2008). These individuals will be generally very active and outgoing and live alone. One thing that we need to account for is the natural aging effect that degrades and limits their physical capabilities such as difficulty in hearing, vision, cognition, self-care, and independent living (Andrews & Phillips, 2005), (Findlay, 2003).

Such reduction in older adults’ senses and reflexes eventually endangers and inhibits them from driving (Fisk, 2009), which leads them to use other means of transportation in order to maintain their independent way of living. However, 90% of North Americans depend on automobiles and current elements of public transportation systems such as buses present barriers to older adults and people with disabilities thus limiting their mobility. Lack of pathways that lead to bus stops, unavailability of bus routes to
hospitals, malls, and senior centers as well as illegible maps and schedules are only a few examples of such barriers.

Figure 1: introduction: Total fertility rate and life expectancy at birth, world 1950-2050 (Administration on Aging, 2008).

This study focuses on the needs and expectations of older adults when using public transportation. I hope to encourage them to use this system which will help boost their self-confidence, regain their independence in order that they can stay in their own homes and communities. At this point, it is important to ask the following question:

What are the requirements that older adults have when using public transportation?
Hypothesis

Due to the lack of proper universal design integration, there’s an accessibility problem in urban public places when it comes to older adults. The absence of essential visual, tactile and auditory cues prevent older adults from easily navigating in their urban public environment, thus destroying their self-confidence and limiting their independence.

Transportation is a means of conveyance. For example, walking, driving or using public transportation such as buses, subways, trains, ships or airplanes. Transportation is a key to continued independence for older adults. It is an essential tool that enables people to play a role in their community. Having access to adequate transportation enables individuals to access needed healthcare and community resources, perform activities such as shopping and engage in social activities at social centers. Social isolation and lack of mobility are associated with poor health, depression, loss of autonomy, and lower overall quality of life. (Chapter 2: Social Isolation)

The attention of this research is placed on adults who are aged 65 and above and who desire to stay independent. This study targets Columbus, Ohio, USA where the only available means of public transportation is a bus system named COTA (Central Ohio Transit Authority). Therefore, the focus of this research is on urban public bus transits in general and urban bus stops in particular. The emphasis on bus stops is due to their role
as gateways and information points along the journey. An accessible and informative bus stop can reflect and affect the entire experience of the public bus system.

Figure 2: introduction: Frame work of the research from general to specific.

Figure 2 illustrates the frame work of my research following a general to specific logic. This means that the whole topic starts by applying the “universal design” concept in the understanding of “environmental psychology” and its role in “public spaces” in order to provide better “navigation” information for “older adults” to help relieve and prevent the causes of “social isolation” which in the USA is linked to the lack of daily public transportation. Availability of daily “transportation” affects the independence of older
adults which relates to their “social psychology”. However, with time and age people’s independent commuting options get limited to “public transportation”, which in my study is the public bus system. Finally, “bus stops” those are also accessible to older adults and disabled people follow the concept of “universal design” which brings us back to the beginning of the spiral.

This topic is a work in progress. Hence, it is represented by a spiral to show progress and development without ever reaching an ultimate solution. As long as societies, technology and people keep evolving, the spiral will keep expanding and growing into updated enhancements and solutions.

Therefore, the hypothesis states that the final result of the study will not just accommodate older adults at bus stops when using public transportation, but will also benefit all generations and this defines the universal design concept.
On top of that, the topic of this thesis was initiated, as shown in figure 3, with the “inspiration” of universal design and its “application” on daily transportation to better accommodate older adults. However, between the “inspiration” and “application”, the study would not have occurred without the existence of COTA and their support, which created the “opportunity” to apply design and research toward a real problem.
Definitions:

The following are the keywords and terminologies that are being used throughout the thesis. Their definitions are based on the thesis content. Also, secondary technical terms will be defined later in their own contexts.

**Universal Design** is a broad-spectrum solution that produces products and environments that are usable and effective for everyone. Moreover, it recognizes the importance of how things look.

**Urban Environment** is a space or area where there is high density of people, for example cities.

A **public space** refers to an area or place that is open and accessible to all people, regardless of gender, race, ethnicity, age or socio-economic level.

**Navigation** is the process of way-finding, orienting and/or way-following towards a specific destination.

**Way-finding** includes using spatial orientation and signs if available to find a particular destination.
Orientation devices help people to develop a mental map of where they are navigating and the best route that needs to be taken to reach their destination.

Way-following includes the ability to follow sign and/or directions in order to get to a particular destination.

Independent older adults are active people of ages 65 or older, still living in their homes and communities, and self-reliant.

Social isolation occurs when older adults drastically diminish or withdraw their social involvement and instead isolate themselves in their homes.

Delimitations and Limitations of the Study

The delimitations of the thesis are in the content of the research and the structure of the study. Even though the particulars of the study are about COTA, still it is structured in a way that makes it applicable in any other city that has public bus system. Also, the content of the research is gathered from a vast amount of reliable sources so it would be a guideline for any designer who is interested in approaching such a topic.

As for the limitations, Columbus has only COTA for its daily transportation, this means the emphasis on bus systems was an imposition by itself. This situation didn’t provide
options for comparison with any other means of transportation in Columbus other than automobiles.

Also, with the limited time provided for conducting the study, my resources to find and locate older adults were limited as well. Still, I have managed to get a broad sample of independent older adults to participate.

Finally, this being a stereotypical limitation, you will notice in the following chapters that most of the times older adults and people with disability are mentioned under the same category. Such instigation was revealed to me during research and sadly enough a lot of the reliable resources categorize them as one.

Therefore, the next section of this thesis is the literature review on all the topics mentioned in figure 2. Some of them are indirectly relevant to the study like universal design, environmental psychology, and navigation while the rest are the major components of the study like older adults, transportation and bus stops. The sources of the research information are numerous and they are all listed in the bibliography section. Keep in mind the information is provided in a way to create a chain of thoughts and analysis that gets narrowed down at the end to the intended topic of the study that is described and analyzed in the following section.
CHAPTER 2: Literature Review

Section 2.1: Universal Design

Universal design is an inclusive philosophy that says all spaces should be inherently accessible for all users. Rather than focusing on users with specific disabilities, universal design creates solutions that work for everyone, regardless of age, mobility, visual, auditory or mental ability. As many universal design experts like to say, universal design is “cradle to grave” design. In other words, it addresses the needs of every stage of human life without requiring any additional adaptation.

This results in the belief that all public environments, to the greatest extent possible, should be usable by everyone regardless of their age, ability, or circumstance. Because these spaces get a huge amount of use by a very diverse population, a design that is accessible and usable for everyone is crucial.

While ADA (American Disability Association) guidelines focus on modifying the built environment to make it more accessible for people with disabilities, universal design believes that the entire range of human capabilities should be at the heart of the design process. “The traditional design process assumes that designers will be designing for
people just like themselves,” says Valerie Fletcher, Executive Director of the Institute for Human Centered Design. She adds that “universal design requires thinking about all users”.

Still, experts in the field of universal design do follow ADA guidelines, because ADA is in fact a civil rights law and because when a design is easier for someone with a disability, this means it might also be easier for everybody.

Not only is universal design the right thing to do for the 21st century, it also represents the general trend of what consumers will expect, according to John Salmen, President of Universal Design Consultants. Salmen says that “people expect things to be accessible”.

For people, an accessible design is one that accommodates their specific needs and expectations. Through user-centered research, designs are being tailored to target specific market segments. However, when it comes to publicly-accessible designs such as public transportation, specificity and exclusivity are not the key elements. The more universal the design is, the more accessible it will be to all people.

The Seven Principles of Universal Design

A working group of architects, product designers, engineers and environmental design researchers, collaborated to establish The Seven Principles of Universal Design (Rossetti,
to evaluate existing designs, guide the design process, and educate both designers and consumers about the characteristics of more usable products and environments. A brief summary of these principles is discussed in the following paragraphs.

**Equitable Use:** How useful and marketable is the design to people with diverse abilities? This is not just referring to a design that is appealing and available to all users, but it is also referring to a design that is able to identify and satisfy the overlapping demands.

**Flexibility in Use:** Is the design accommodating to a wide range of individual preferences and abilities? The design should provide choices, adaptability and possibility for customization. This is not just in the visual design, but also in the functionality and methods of use.

**Simple and Intuitive Use:** How easy is it to use and navigate the design? Regardless of the user’s experience, knowledge, language skills and current concentration level, the design should be simple and easy to understand. Less is more and consistency in information arrangement awakens the user’s intuition and facilitates the task completion.

**Perceptible information:** Does the design communicate necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities? Hierarchy and redundancy of essential information is required. The use of different modes such as pictorial, verbal and tactile supports compatibility for all people.
**Tolerance for error:** Can the design minimize hazards and adverse consequences from accidental or unintended actions? Support the design with warning for hazards and errors. Also provide fail safe features.

**Low physical effort:** Is the use of the design efficient and comfortable with minimum fatigue? This should be accessible to all people regardless of their strength and endurance capabilities.

**Size and space for approach and use:** Can the design be approached, reached, manipulated and used by all people regardless of body size, posture or mobility?

As we notice, these principles do not depict a specific set of rules and regulations that one can easily follow and apply. Instead, universal design is a discipline that requires ongoing evaluations and enhancements in order to better accommodate the widest range of users possible in a single design.

In addition to these seven principles, other considerations such as economical, engineering, and cultural concerns must be incorporated in the design process.

Edward Steinfeld, Director of IDEA Center (Center for Inclusive Design and Built Environments), once explained: “Universal design updates can be done incrementally —
do it within your means. You don’t need to do it all at once. It’s a philosophy of practice, not a set of rules.”

Going back to the frame-work illustration above, the application of “universal design” concept, for this thesis, happens in “public spaces”. This next chapter will discuss the effect of environmental psychology on human navigation in public spaces.

Section 2.2: Public Space

Environmental Psychology

Environmental Psychology deals with behavior in relation to the physical environment. The physical environment includes material objects, plants, animals and human beings.
Environmental Psychology does not focus on the interaction happening between people. It is more holistic and naturalistic and studies the adaptation of people to their environmental settings.

*Influence of Environment on Behavior*

It has been hypothesized that environment influences behavior at several levels. Immediate behavior is a function of the settings in which it occurs. For example, the arrangement of furniture in a room influences the way in which people in the room interact. The personality of people is shaped by the nature and type of environment to which they are subjected for long periods of time. (Mathew, 2008)

Many studies demonstrate the harmful influence of urbanization on human behavior. People’s behavioral patterns seem to change under artificial and overpopulated urban conditions. It has been shown that the incidence of mental illness increases with urbanization. Only about one fifth of the population of big cities seems to be relatively free from symptoms of pathology. Crime rates in big cities are also increasing at an alarmingly high rate and many of the major cities of the world have come to be known as crime cities. (Mathew, 2008)
Applied Environmental Psychology

Applied Environmental psychology aims at a better management of the environment for better life and psychological growth. It studies effective ways of conserving the natural environment, better ways of designing towns and cities and means of promoting environmental awareness among people.

Studies on how the community works, the psychological needs of the people and their likes and dislikes should be considered while planning the growth of towns. Since the environment shapes and limits behavior, proper planning to ensure maximum satisfaction, efficiency and growth is essential.

It has been shown that closeness to elements of nature like pools, plants and trees makes people more relaxed. Hence, one of the main considerations of town planners and architects is how to incorporate elements of nature in their designs. (Mathew, 2008)

Designing for Experience

Designing experiences should aim at influencing people’s sentiments, emotions and insights that are relevant and interesting to people. In other words, experiences are very much people’s reaction to an input some producer has created.
In public places, the producers are the providers of general frames that affect people’s experiences accordingly. However, producers cannot control people’s conditions or include all people’s personalities or lifestyles. They may set the stage, but it is the people who create the scene and experience.

A good experience should direct people to establish certain values, habits and lifestyle. An example is orientation and way-finding in urban spaces or using public transportation.

Experiences in social settings are determined by unforeseen events of time, space and mind. Urban designers have to manage and control space in order to create frames for present and future experiences. The dilemma lies in the staging of the scene. Whatever design is being implemented, it has to last for a very long time and adapt to any future changes. This time factor cannot be controlled. (Jantzen & Vetner, 2008)

_Urban experiences_

The essential attraction of urban experiences is that they contribute to self-development by being challenging and versatile and by relying on intense face-to-face interactions in the public sphere.

Physiologically, pleasure is derived primarily from stimulation and excitement, for example, excitement when being confronted with something unexpected. However,
points of rest and relaxation are necessary to avoid stress or anxiety from the accumulation of too many unanticipated surprises.

From this perspective, a single person’s experience is continuously changing and developing. These changes occur based on the person’s understanding and familiarization with the city and its content.

Attractive urban environments are characterized by ample space: parks, plazas, cafés, etc., which also offer possibilities for socializing. Moreover, landmarks and proper orientation cues may prevent the city-dweller from getting lost. The urge for stimulation and excitement does not erase a need for orientation and feeling safe.

Urban experiences can vary significantly among city-dwellers. For example, some dwellers may want to give zest to their suburban existence. They do regular trips to urban centers to add flavor to their daily existence. Other dwellers may use the urban setting to get permanent thrills by exploring new areas or streets.

Therefore, for an urban experience to be successful, universal design principles are to be considered in order to encompass all these diversities for the longest period of time.

(Jantzen & Vetner, 2008)
A public space is open and accessible to all, regardless of gender, race, ethnicity, age or socio-economic level. For example, no fees or paid tickets are required for entry, nor are the entrants discriminated against based on background or limited by a certain regulation. Most streets, including the pavement, are considered public space, as are town squares or parks. Government buildings which are open to the public, such as public libraries are also considered public space.

However, there is a broader meaning of public space or place. This includes places where everybody can come if they pay, like a café, train, or movie theater. A shop or a mall is another mistaken example: everybody can enter and look around without obligation to buy, but activities unrelated to the purpose of the place are not unlimitedly permitted. (Nelson & Easter Seals Project ACTION, 2001)

As a clarification, public transportation, especially a bus stop, is not considered a public space even though the setting of the place usually occurs in a public area.

However, public transportation in my analysis has been compared and treated as a public space because it is used by a wide variety of people. Such means of transportation should definitely have the universal design principles applied to it.
**Navigation**

Getting people from place to place and orienting them in complex spaces is increasingly complicated, especially with all the transportation options that are now available.

Navigation is the organization and communication of people’s dynamic relationship to space and the environment. A successful navigation process allows people to: (1) determine their location within a setting, (2) determine their destination, and (3) develop a plan that will take them from their location to their destination. (Gibson, 2009)

However, the design of navigation systems should include: (1) identifying and marking spaces, (2) grouping spaces, and (3) linking and organizing spaces through both architectural and graphical means. (Lynch, 1960) (Passini, 1984)

The organization of most navigation systems is modeled after urban planning: districts, streets, or landmarks can all be used to help make places easier to understand and navigate. For instance, districts are universal and good for way-finding: the place gets divided into meaningful zones that can be indicated on signs and maps. Streets are good for way-following. They are easily recognizable corridors and pathways that form a network across the space or map. As for landmarks, they direct people to major nodes like elevators or primary destination points. They are good for orientation.
An example of this is when the United States Post Office established zip-codes that were superimposed over New York’s street grid. These codes facilitate mail and parcel delivery.

Another example is the city railroads. In the second half of the nineteenth century, city railroads began to connect city dwellers to workplaces and recreational destinations. By the early twentieth century, these railroads came together to form mass-transit systems. As these systems grew after the turn of the century and the public needed help differentiating routes, map makers began to color code the different lines. Harry Beck’s map design for the London Underground, issued in 1933, changed transit maps forever. He organized the spaghetti of routes into a system of lines all drawn at consistent angles. He structured the typography over a grid. This brilliant map codified and abstracted spatial information, a revelation of navigation systems.

There are four main components of navigation: (1) way-finding, (2) orientation, (3) directional information/way-following, and (4) destination identification. (Gibson, 2009)

Way-finding

Way-finding includes using spatial orientation and signs if available to find a particular destination.
Typical way-finding information includes systems made up of text, pictograms, maps, photographs, models, and diagrams. Visitors are required to observe, read, learn and comprehend these systems as they make their way through a space.

Urban planner Kevin A. Lynch in his 1960 book *Image of the City* defined way-finding as “a consistent use and organization of definite sensory cues from the external environment”. (Lynch, 1960)

In 1984, environmental psychologist Romedi Passini published the book *Way-finding in Architecture* and expanded the definition to include signage system, visual communication, clues inherent in space planning, audible communication, tactile elements, and requirements for people with disability.

A few general guidelines for proper graphic way-finding are (Center for Inclusive Design and Environmental Access, 2010):

- Be consistent with text and graphic devices and the location of signage throughout the system.
- Use upper and lower case letters for highest legibility except in the case of single word signage.
- To increase legibility, avoid single line spacing.
• For best legibility, the space between words in signage is typically the lower case "e" of the given font.
• Group information on complex signs to increase comprehension.
• Display common rather than obscure or technical names (e.g., use Ear, Nose, and Throat rather than Otorhinolaryngology).
• Avoid abstract or difficult-to-learn pictograms.
• Whenever possible, use pictograms and text together for reinforcement.
• In signage, use colors that are easily recognizable by name such as blue, orange, gray. Reserve the colors red, yellow, and green for public safety uses.
• Use color combinations that are of high contrast.
• Design lighting, windows and surfaces to prevent glare on signage.
• Place signs within the cone of vision to increase detection and legibility.
• Repeat information displayed for longer distance detection in a format for close detection.
• Avoid blocking signage with trees or other street furniture.

Additional guidelines for proper way-finding system include (Apelt, Crawford, & Hogan, 2007):

• Deliver information for users to recognize they are at the correct start or finish point.
• Repeat information for users to recognize they are traveling in the right direction.
• Provide answers to potential queries before users have to ask for assistance.

Orientation

Orientation devices such as maps, site plans, floor plans, building, and floor directories are used to help people develop a mental map of a large space. This is typically the first level of graphic information given for decision-making in an unfamiliar setting. These devices should help people determine where they are, where their destination is, and what the best route is to their destination.

Guidelines (Center for Inclusive Design and Environmental Access, 2010):

• Maps and plans should be oriented in the direction corresponding with the setting and orientation of the viewer.
• Provide a "you are here" symbol to help in orientation.
• Include key landmarks in the map.
• Provide text labels on maps that correspond to directional and destination signage.
• Use familiar or easy-to-learn pictograms to reinforce the text and to bypass language-based information.
• Tilt maps and plans displayed for pedestrian use so that people of all statures and those who are seated can access them.
- Place exterior maps in locations that are out of the way of moving traffic to access the map.

**Directional Information/way-following**

This type of signage guides people along a route to a destination, and is given after they have had the chance to orient themselves to the general setting. Most often this includes signs with arrows.

**Guidelines (Center for Inclusive Design and Environmental Access, 2010):**

- Emphasize information offered in directional signage with architectural indicators such as wall graphics or landscaping that lead to the destination.
- Supplement directional information with maps at key decision points to reduce the amount of directional signage.
- Place signs in transitional areas to reassure people that they are on the correct route.
- In intersections, place signage to ensure that those coming from all directions can detect the information.
- Use interactive multi-sensory systems at key decision-making points to provide more information and flexibility than is possible in a static signage system.
• Keep the font size consistent. Use font weight to determine the importance of information.

• Light letters on a dark background appear larger than dark letters on a light background and therefore are recommended for directional signage.

• Maintain consistency of arrow styles and use throughout the system.

• Avoid more than five messages and five lines of text in a single directional sign.

• Use familiar or easy-to-learn pictograms to reinforce the text and to bypass language-based information.

After going over the general understanding of navigation, still its application, in this thesis, is on older adults. The best approach for specifying older adults’ navigational skills is by learning about their environmental cognition.

**Environmental cognition of older adults**

Environmental cognition involves the representation and retrieval of information of actual physical settings.

A study, which was published in the Journal of Gerontology 1984, examined the local residents’ cognitive mapping skills in the city of Orange, California. They compared older adults’ memory of the city’s map to that of younger adults.
The data showed that older adults remembered places they frequented more or had a direct experience with the place. Symbolic significance and uniqueness of architectural style is a trigger for older adults’ knowledge of buildings. Also, naturalness around buildings may attract older adults who have greater leisure time than most young adults and thus can appreciate and explore gardens, small parks, and landscaped areas.

The same study also indicated that older adults have less complete knowledge of their own environment than young adults. The data also showed that older adults are less accurate in locating highly familiar buildings. This finding is consistent with other experimental studies conducted by (Weber & Weldon, 1978), (Perlmutter, 1981), (Walsh & Regnier, 1981), (Ohta & Kirasic, 1983).

Therefore as it has been shown and proven that historical landmarks, natural landscaping and buildings with high use may facilitate urban legibility for older adults. (Evans, Brennan, Skorpanich, & Held, 1984)
This latter segment, the environmental cognition of older adults, hints to the next chapter of the literature review. As shown in the frame-work illustration above, the next topic is about “older adults”, the targeted population in this thesis.

Section 2.3: Older Adults

Statistics, Pyramid

Older Americans (age 65 and over) are the fastest growing segment of the U.S. population—in the coming decades the baby boomers will swell the ranks of the older population to one in five of all Americans.
Life expectancy represents the average number of years of life remaining to a person at a given age if death rates were to remain constant. In the United States, improvements in health and life expectancy have contributed to the increased numbers of older adults above age 65.

As we notice from figure 4, older adults are living longer than before. The numbers are only expected to be higher for 2010 and 2020. Currently people who are of age 65 can expect to live an average of 19 more years and those who are 85 years old will live approximately 7 more years.

According to the United States Census, there will be a spike in the age 60+ population from 43,873,000 in 2005 to 73,769,000 in 2020, an absolute increase of 68 percent. In
2009, the population in Ohio was 11.5 million. Fourteen percent of this population was 65 years and older. For older people, 58.5% are females and 41.5% are males. These numbers are taken from the U.S. Census Bureau (U.S. Census Bureau, 2009).

*Patricia Moore*

Patricia Moore, an industrial designer and gerontologist, has been studying and designing for elderly people since 1979. At the age of 32 she started disguising herself as an older person and integrated all the physical barriers an older person might face in her costumes. From that, she is known for conducting first hand experiments and designing for older adults based on the experiences she would face.

During her current reflections of the years of studies and experiences she said:

"I was prepared for the physical difficulties, but not for my own emotions that resulted from others' dismissal, cruelty, attitudes, and actions. On one occasion I was even attacked by a gang of boys on an isolated street, mugged, beaten, and left for dead. I still suffer from some of those injuries."

"An elderly can sit for hours and help a little child. Really, the two ends of the age spectrum have a lot in common. We can't design separately for the 'young,' for the old, and for every age in between. We have to think of it as a lifelong continuum."
"There are 78 million baby boomers, and not all of them are going to retire to a nice condo in Scottsdale. It's not about money; it's about quality of life."

(Westbrook, 2010)

Old age effects

Biological Aging

The aging process begins at birth and is the normal continuum of the course of life development. It is not an indicator of disease. It is important to recognize what are the normal or true age changes, what are the results of disease, abuse, disuse, and misuse, and what can be prevented. Aging, for the older adults, includes biological changes such as in the functioning of hearing, vision, the skin elasticity, the regulation of body temperature, hair color, and hair loss. Aging is also reflected in a slowing of biological systems. The rate of decline is related to the individual’s genetic predisposition, environment, and lifestyle. (School of Social Work, 1997)

Changes in the neurological system include a slowing of response times. The decline in response time does not indicate cognitive decline. Slight losses in short-term memory and complex problem solving ability are often considered normative.
A common effect of aging in the musculoskeletal system is the compression of the spine that results in becoming shorter. Once again exercise is key in maintaining muscle mass and strong bones.

The sensory system includes vision, hearing, touch/physical sensations, taste, and smell. The sensory system changes occur gradually over time. Older adults are more sensitive to light and glare and often have difficulty driving at night due to the glare of the headlights. Frequently, their diminished abilities to distinguish differences in color results in loss of depth perception and decreases in peripheral vision.

Hearing loss can be caused by continued exposure to an environment of loud noises. Changes associated with aging are connected with the inability to distinguish between sounds as opposed to not being able to hear them. The use of hearing aids often makes it difficult to distinguish between sounds. Speaking in lower tones to the older adult may help the older adult understand what was said more clearly.

Due to the decline of the responsiveness in the neurotransmitters, older adults do not experience physical sensations the same way as when they were younger. Seniors may not seek needed medical attention due to decreased intensity of symptoms, considering it more of a discomfort or something not to be bothered with since they have a higher threshold of insensitivity to pain. The sensitivity to temperature is also affected during the aging process. The body’s ability to self-regulate temperature diminishes.
Our role as designers is not to diagnose disease but to understand and evaluate the older adult’s ability to live independently and assist in creating and coordinating interventions that will help them maintain his/her independence, quality of life and grow old in their homes and community for as long as possible.

Due to these physical declines, older adults tend to become more isolated. Limited capabilities and decreased mobility are the key factors leading older adults to withdraw from social activities.

(School of Social Work, 1997)

_Elderly life phases_

One way of understanding older adults is by expanding the mature age into 4 phases of growth and development. (Cohen, 2006)

Phase 1: Re-evaluation, exploration and transition; early forties to late fifties.
Phase 2: Liberation, experimentation and innovation; late fifties to early seventies.
Phase 3: Recapitulation, resolution and contribution; late sixties through eighties.
Phase 4: Continuation, reflection and celebration; late seventies to end of life.

The older adults on whom I’m focusing are in phases 3 and 4. I will elaborate on this in the following two paragraphs.
Phase 3 is the “summing up”. People in this phase feel the desire to find larger meaning for the story of their lives through a process of review, summarizing and giving back. They start observing themselves as keepers of the culture and often want to contribute to others more from whatever wisdom and wealth they may have accumulated. Also the summing up process can lead to confronting unfulfilled dreams and to bring closure to unresolved conflicts.

Phase 4 is the “encore”. This phase is an indicator of the restless brain creating an inner push for reflection and a desire for continuation and celebration. Despite illness or physical limitations, during this time of life, people are still driven for love, companionship, self-determination, control and giving back. This is often shown through their sense of humor about the realities of mortality and frustrating aspects of growing old. The brain itself will remain resilient. So does the mood and emotional outlook regardless of physical problems. (Cohen, 2006)

*Social perspectives and theories on aging*

Every society perceives and engages older people differently. Even within the same society several theories of involvement are applied. A few examples of these perspectives and theories are listed below. (School of Social Work, 1997)
Activity Theory

Activity theory suggests that older adults who are active, physically and mentally, will age successfully. Older adults who participate in social activities, part-time work, travel, and/or hobbies find greater satisfaction throughout their later years.

Continuity Theory

The continuity theory states that older adults and society find mutual satisfaction when older adults maintain their consistent form of living throughout their lives. The older adults are a continuation of the younger version of themself.

Social Reconstruction Theory

Social reconstruction suggests that society’s negative views of the elderly diminish the self-concept and self-worth of the older adult. This theory advocates changing the environment, providing supportive systems for the older adult, and assisting the older adult in regaining control and independence in his or her life.
Social Disengagement Theory

Social disengagement theory suggests that there is a reciprocal withdrawal by society and the older adult. The senior withdraws from the social activity due to physical limitations or retirement. Society in return views the older adult as non-productive and having nothing left to offer society.

Social Exchange Theory

Successful relationships are based on mutual benefit. A parent cares for a child not only out of love but also as an investment for future security in old age. The child in return takes care of the aging parent out of obligation and love. The stress of caregiving can sometimes outweigh the sense of obligation or love that a caregiver feels, causing an imbalance in the mutual benefit, leading to caregiver burnout. As the frustration of caregiving increases so increases the risk of abuse, abandonment, or neglect.

Cultural Perspective

Culture is a set of beliefs, role identifications, behavioral patterns, values, and traditions that are passed from generation to generation. Due to the diversity of people it is imperative to use a perspective that acknowledges the effect of culture on the behavior of the elderly. For example, Asians view old age as a time to decrease activity. Westerners
generally assess successful aging based on how much activity can be sustained from the middle adulthood stage of life.

Ecological Perspective

For the older adult, the influences of the social environment can be seen as lacking in services and resources provided for the continued independence of the elderly. Affordable housing, transportation, and medications are often a problem for the elderly who are often living on a fixed income. Poverty continues to be a major problem for the older adult. Poverty rates are 10.5% at 65 years and older in the United States and 8.4% in Ohio.

Life Course Perspective

This perspective states that old age is the culmination and continuation of life experiences, social roles, transitions, history, and adaptations. The life course perspective views old age as a positive period of continued growth.

Even though theoretically older adults own the choice of deciding the way they want to live their lives, however social pressure, whether it is positive or negative, can affect and influence an elderly’s choice. (School of Social Work, 1997)
**Social Isolation**

As the proportion of older people in the population increases and more live alone (World Health Organization, 2002), the problem of social isolation among older adults is of growing concern.

Factors contributing to social isolation include poor physical health, mental illness, low morale, geographic location, loss of home and known environment after moving to institutionalized care, loss of social roles especially after retirement, and communication and transport difficulties (Brennan, Moore, & Smyth, 1995); (Edelbrock, Buys, Creasey, & Broe, 2001); (Haven & Hall, 1999); (Russell & Schofield , 1999). Many of these factors are often beyond the socially isolated person’s control. Thus, designing effective interventions to address the problem is difficult.

Also, there is evidence that the size of one’s social network gradually declines in old age. The impact of reduced social networks in old age has been demonstrated by Pinquart and Sorensen (2001), who found that between 5 and 15% of people over 65 report that they frequently feel lonely and an additional 20 to 40% occasionally feel lonely.

On the other hand, socio-emotional selectivity theory (Carstensen, Ornstein, & Patnoe, 1991); (Carstensen, Fung, & Lutz, 1999) suggests that the reduction in social networks and social participation should be seen as a proactive response by older people to manage
their social world. They reduce their social network to conserve energy, and select some people who bring about positive emotions and strengthen their self-esteem.

Regardless of the natural reduction in activity and social contact, most research indicates that engagement in social interaction is far more beneficial than isolation for the health and wellbeing of older people (Bower, 1997); (Fratiglioni, 2000); (Pennington, 1992); (Moyer, Coristine, MacLean, & Meyer, 1999); (Victor, Scambler, Bond, & Bowling, 2000). Furthermore, social isolation has been linked to increased mortality rates for people aged over 65 years (Bower, 1997), elevated blood pressure (Bower, 1997), increased dementia (Fratiglioni, 2000), depression (Gutzmann, 2000); (Silveira & Allebeck, 2001); (Warner, 1998), and suicide (Centers for Disease Control and Prevention, 1996); (Rapagnani, 2002).

There is a belief that interventions can counteract social isolation and its adverse effects on older people, but the research evidence in support of this belief is almost non-existent. However, until this belief is proven wrong, attempts for maintaining older adult’s social psychology through finding solutions to the previously-mentioned problems is a duty. (Findlay, 2003), (Andrews & Phillips, 2005)
Grand generativity (Andrews & Phillips, 2005)

Social psychology is the scientific study of how people's thoughts, feelings, and behaviors are influenced by the people, community and society around them.

Erik Erikson, a pioneering psychologist, created the grand-generativity theory in 1986. This theory states that a person’s interaction with the environment, and particularly the social environment, is important for giving purpose to later life.

According to Erikson, grand-generativity activities such as assisting friends and neighbors, caring for the wider community, volunteering, and expressing concern for environmental issues allows older people to be socially proactive and valued, and to leave a permanent legacy (McAdams & de St. Aubin, 1992).

Aging in place

(Andrews & Phillips, 2005)

The vast majority of Americans want to remain in their communities as they age. Contrary to popular belief, only a minority actually move to warmer climates upon retirement. Fewer than 5 percent of the 65 and over population reside in nursing homes. Instead, most Americans choose to age in place, within the same communities where they
have long lived. Therefore, every community, from fast-growing suburbs to more stable rural areas, will have to adapt to a maturing population.

**Getting outdoors**

The inaccessibility and difficulties presented by many outdoor environments is a major problem affecting elderly people at present.

Prolonging the independence of older people will enable them to live in their own homes for as long as possible. Current research demonstrates that, as people age, remaining in a familiar home and neighborhood tends to become more important. There is also a shortage of alternative accommodations. Over the past few years, the number of elderly residential care homes that are closing down has greatly exceeded the number of homes that are being established (A Blueprint for Action: Developing a Livable Community for All Ages, 2007)

Research on the design of home environments that enhance older people’s independence has led to innovations such as ‘Smart Homes’, but very little research has addressed the outdoor environments that surround these homes. If older people are to stay at their own homes, they need to be able to continue to use the wider environment, including their local neighborhood, and to go outdoors, otherwise they will be effectively trapped inside.
Getting outdoors offers physical, sociological and psychological benefits for older people. Physical inactivity is a major hidden cause of disease and disability (The World Health Report 2003, 2003). Since physical inactivity is a very common, yet preventable, risk factor, supporting older adults in having an active lifestyle is one of the most important health initiatives, and getting outdoors has been shown to be one of the best ways to stay active. Spaces that are easy for older people to use contribute to a more active life-style (Sugiyama & Ward Thompson, 2007).

The social benefits of getting outdoors include practical considerations such as being able to get to the shops or the post office, as well as being able to visit friends and have informal contact with neighbors. Activities in open spaces are associated with greater social integration and stronger social networks among neighbors (Kuo, Sullivan, Coley, & Brunson, 1998).

In addition to the psychological benefits that social interaction has on older adults, simply getting outdoors has its own psychological benefits. Contact with nature has been shown to reduce mental fatigue, thus, aiding in the restoration of older people’s alertness (Kaplan & Kaplan, 1989); (Kaplan S., 1995) and stress reduction (Ulrich, Simons, Losito, Fiorito, Miles, & Zelson, 1991).

The social aspects of an environment affect older people’s engagement and involvement with outdoor spaces. If people perceive their open spaces as facilitating and supportive of
their activities, they are more likely to spend time outdoors and to have positive experiences. Pleasantness can be established through facilities and amenities. Furnished places can be inviting and can create more opportunities for older people to interact socially. Also, well-maintained open spaces are more attractive and engaging for leisurely activities such as watching nature or doing sports.

**Quality of Life**

Quality of life involves both physical and psychological components. The “quality” of life in this context is the combination of environmental and social aspects. In this sense, differences between older adults, as individuals, play a great role in defining their quality of life. Also, the same environment may offer different opportunities to each individual.

What determines an appropriate environment for elderly activities according to Lawren (1986) is whether the land can be purposed for diverse activities; whether street patterns easily connect to shops and recreational facilities, and whether good quality pavements are present on these streets and away from traffic and crime areas.

*Transportation for older Americans*

Transportation provides the vital link between home and a community designed for all ages. It connects individuals to the places where they can fulfill their basic needs like
grocery shopping, doctor’s appointment… or go to work, visit friends and family, go to recreational facilities or houses of worship.

In a study called “The New Retirement Survey,” conducted by Harris Interactive, a research and consulting company, 76% of Baby Boomers reported that they want to continue to work and earn money into retirement, and that is after the conventional retirement age of 65. That translates into a larger percentage of the population that may have mobility, visual or auditory disabilities, but still intends to remain active.

To live independently, older Americans must be able to maintain a mobile lifestyle. In most communities today, that means owning and driving a car. But the process of aging, as we have discussed earlier, often involves a deterioration of physical and functional skills that can make driving more difficult. The physical environment often compounds the difficulty through signage and road design that can confuse and endanger drivers of all ages and abilities. When visiting the doctor or getting a bag of groceries becomes an ordeal, older adults can become less healthy and more isolated.

Most adults fear the prospect of giving up their car keys, and that’s for a good reason. Since World War II, roads and communities have been designed primarily to serve automobile travel. Enabling older adults to remain mobile and engaged in their communities will require both new ways of transportation planning and design and a
rediscovery of streets and communities that balance the needs of pedestrians, cyclists, transit users, and automobiles.

Community provides support and service. However, the core American values, autonomy and independence, are reflected in the fact that most prefer and rely on the convenience of their own automobile to maintain their access to the outside world. By 2030, 25 percent of licensed drivers in the United States will be over the age of 65.

In order to maintain the safety of older drivers, a range of developments is required from older driver assessment and retraining programs to road improvements, such as larger print signs, dedicated left-turn lanes or signal arrows, and grooved lane markings.

When older adults need to limit or stop driving, they can experience a drastic decline in mobility. In suburban and rural areas, which are home to nearly 80 percent of the older population, destinations are often too far to walk, public transportation is poor or unavailable, taxi service is costly and special services can be limited.

As we know, reduced mobility can put an older person at higher risk of poor health, isolation and loneliness. Transportation options are needed at the community level to help older drivers stay on the road for as long as safely possible and then, once they must limit their driving or can no longer drive at all, to provide a range of transportation options to ensure that older adults can maintain their mobility and independence.
One example is Buncombe County, an urban county surrounding the Asheville metro area in western North Carolina, which has responded to a need for transportation for older adults.

This county has a population of approximately 206,000 and is experiencing an immigration of older adults. Mountain Mobility, the county’s community transportation program, provides several mobility options to older adults including door-to-door para-transit service and bus passes for seniors of age 60 and above. Services include travel to visit the doctor, obtain therapy and other health care treatments, grocery shopping, participate in senior dining and senior center programs, and taking care of personal business and other needs of daily living. These services are funded through the county’s Aging Services Division, which administers an allocation of state and federal funds to provide direct services to older adults age 60 and over that enhance their quality of life, promote independence and delay placement in long-term care facilities.

In addition, Mountain Mobility’s Senior Bus Pass program is a new initiative available for seniors who live within the city of Asheville and who are able to use the Asheville Transit fixed route bus system. Seniors aged 60 and older can apply for a free monthly bus pass. Bus passes are paid for by Mountain Mobility through Aging Services funds, as well as other supplemental grant funds. The Senior Bus Pass Program addresses specific recommendations in the Buncombe County Aging Plan related to encouraging creative approaches to increase the public transportation usage among seniors.
Challenges of Driving

The National Household Transportation Survey (NHTS) is the unique source of data on travel by different population groups. The survey shows that the percentage of older people who continue to drive is growing, and the growth in older drivers is especially marked among older women.

Per mile driven, elderly drivers (those over 80 years old) are more likely to die in a crash than any other age group. The importance of calculating the crash rate by miles driven, rather than by population or percentage of licensed drivers, is that it puts accidents and fatalities into the context of the amount of driving done.

Driving skills decline with age and the vulnerability to injury in a collision increases. Older drivers drive fewer miles than younger drivers but are more likely to be injured or die in a crash of the same severity.
Driving involves a complex combination of skills including vision-attention, motor-coordination, and cognition (Shipp & Melvin, 1999); (Owsley, 1997); (Fox, 1997).

Of all these skills, however, vision plays one of the most important roles. 90% of the incoming information received during driving is visual information. Some experts believe that visual information, apart from all other sensory information, would be enough to drive safely (Fox, 1997). With this in mind, it is easy to see that vision impairments can have significant impacts on safe driving.

One of the most noticeable requirements for elderly safe driving is the need for increased lighting due to the changes in vision. This means that driving becomes even more
dangerous for the older adults at night. This change is so significant that many older adults choose to stop driving during the dark hours (Rubin, 1999).

Their ability to drive safely is also influenced by age-related problems with glare. Older adults experience more glare and take much longer to recover from glare than younger drivers (Brabyn, 1999). During this recovery time, the elderly are effectively blind, making them unable to use the visual information necessary for driving. During the already problematic dark hours, the major source of glare is headlights from oncoming cars. During the day, glare results from the large amounts of natural light entering through the windows of the vehicle. Window tints and sunglasses may help to control glare, but will further limit the amount of light that enters the eye.

Other age-related changes are reduced depth perception, visual attention, and size of visual field (Rubin, 1999). A reduction in depth perception means that elderly drivers will have a harder time judging distance than younger drivers. Reduced visual attention impacts driving because older adults are less able to concentrate on all the visual stimuli involved in driving. Of these three, the most impairing change may be the reduction of the visual field. While it is vital that drivers be able to clearly see the road ahead, it is just as important to see the surrounding areas. Older adults with a reduced field of vision may not be able to see possible dangers, such as cars pulling onto the road, people, animals, or emergency vehicles which may enter the road suddenly.
Vision impairments can influence the ability to drive in more subtle ways. One is the inability to read dashboard instruments (Baker, 1989). While some components use large print, like most speedometers, other components use font that may be too small for the elderly driver to read. People who cannot easily read gas and temperature gauges may unknowingly put themselves in dangerous situations. Other automobile parts may also use print that is too small, such as radio and air conditioner controls. Elderly drivers may be unable to drive safely when attention is divided between the road and inside controls.

Reading signs while driving can also present a challenge to the elderly drivers. They may need to slow down their vehicles to read a road sign, which can put them at risk for an accident with faster traffic. If they do not slow down, the risk may be smaller, but they cannot read the sign.

(Nolan, 2002)

Obviously, the challenges of driving cannot be easily solved for the elderly drivers.
With all these challenges being addressed, the next chapter tends to seek solutions and state alternative means of transportation for elderly drivers living in Columbus, OH. This covers the last three areas in the above frame-work illustration: “transportation”, “public transportation”, and “bus stops”.

Section 2.4: Daily Transportation

The most complete data on nationwide travel behavior in the United States is provided by the Nationwide Personal Transportation Survey (NPTS), conducted by the U.S. Department of Transportation.

An investigation of the 2001 NPTS and trend data from other NPTS surveys confirms USA’s excessive reliance on the automobile for personal travel. Travel by private vehicle
accounted for 86% of all person trips and 91% of all person miles, while walking accounted for only 5% of trips and less than one percent of miles. Significantly, non-work trips for purposes such as shopping, entertainment, or recreation accounted for 82.7% of all trips (Federal Highway Administration [FHWA] 1997).

Data from the 2001 NPTS show that about 56 million walk trips and 9 million bicycle trips occur in the U.S. each day. Of the walk trips, 77% were for personal or social purposes, 14% were to church or school, and 7% were to work. Of the bike trips, personal and recreational travel accounted for 82%, church and school 9%, and work 8% (FHWA 1997). (Schmid & Killingsworth, 1997)

*Public Transportation*

The characterization of public transportation in America is based on an analysis of the National Household Travel Survey (NHTS) database and the former Nationwide Personal Transportation Survey (NPTS). The NHTS database provides an opportunity to develop current and useful information to aid in public transit planning and analysis. While the NHTS data base contains a relatively small sample of public transit trips in the nation, which is inappropriate for service planning in a specific geography, it does provide an understanding of travel behavior that can be used to shape the transit industry’s understanding of customer needs and behavior.
Public transit includes four categories of transit modes: bus, commuter train, streetcar/trolley, and subway/elevated rail.

Bus: The bus category includes local buses and commuter buses that are available to the general public. However, shuttle buses operated by a government agency or private industry for the convenience of employees, contracted buses, city-to-city buses, and school buses are excluded.

Commuter Train: The commuter train category includes commuter trains and passenger trains other than elevated rail transit and subways.

Streetcar/Trolley: The streetcar/trolley category includes trolleys, streetcars, and cable cars.

Subway/Elevated: The subway/elevated rail category includes elevated railways and subway trains in a city.
The share of personal trips carried by public transportation has steadily declined reaching its lowest level in the mid 1990’s before reversing course and showing a positive trend in the latter part of the 1990’s. Recently, ridership growth has resumed. In the 2001 to 2004 time period, the slowing economy and financial pressures on transit agencies resulted in fare increases and service cuts that contributed to a resumption of declining transit usage.
Bus Transportation

Some large cities in the USA provide a choice of different methods of public transportation. However, in Columbus, OH, where my study is conducted, the only available public transportation is the COTA (Central Ohio Transit Authority) bus transportation. Therefore, my research focus is limited to bus transportation only and in particular bus stops.

Bus stops are the key links in the journey of a bus rider. For older adults and people with disability, inaccessible bus stops often represent the weak link in the system and can effectively prevent the use of the bus service. Such inconvenience will lead to more demands for para-transit and individual transportation service, hence to an increase in costs.

Bus stops

Considering the experience of public bus transportation, bus stops are more likely to have continuous sidewalks and high transit ridership in urban areas compared to rural areas due to the higher population density.

However, according to the Urban and Rural Areas Census, the percentage difference between populations with disabilities living in urban, suburban or rural areas is minimal.
Approximately 10.9 million (20 percent) of the almost 55 million rural Americans aged five or older have a disability, while urban clusters have the highest proportion of the population with a disability, reaching over 21 percent. Applying accessibility improvements to bus stops is therefore equally valuable in rural areas as it is in suburban and urban areas. (Nelson & Easter Seals Project ACTION, 2001)

Myth 1: Only a small percentage of the transit ridership will benefit from improvements to bus stops. Accessibility improvements for older adults and people with disabilities enhance the usability of transit systems for all riders. For example, paving a grassy surface to serve as a bus stop landing pad provides a stable surface for waiting patrons. Adequate lighting alleviates the security issues of using the bus after dark. Also, good information reduces ambiguity of using the system. Additionally, transit users carrying packages or luggage, pushing children in strollers, or otherwise transporting items will also benefit from accessibility improvements.

The percentage of the U.S. population affected by a condition that constitutes a disability under the Americans with Disabilities Act (ADA) is expected to increase over the coming decades, in part due to the growing elderly population.

As bus stops are located on the public right-of-way or on private property, transit agencies may not have jurisdiction to implement improvements. Though this may be the case, it is in the interest of the transit agency to work with its municipality, community
and businesses on bus stop improvements. Bus stops are the image of the transit service and agency. Poorly maintained, unsafe, uninformative and inaccessible stops convey a poor image of the agency and discourage use. (Nelson & Easter Seals Project ACTION, 2001)

**Principles of bus stops**

For a bus stop to be accessible by all, three principles should be applied.

First, **Barrier-Free Design** entails designing a bus stop and path that all people can easily reach. Second, providing proper and **Accessible Navigation** directions facilitate the journey and eliminates the element of uncertainty which might trigger fear and anxiety for riders. Third, **Safety and Emergency** just in case! In order to encourage people to use the bus system at all hours of the day and in all locations, the bus stop should appear safe and provide solutions for emergency cases. (Nelson & Easter Seals Project ACTION, 2001)

**Design Considerations**

The following table was written by Ryan E. Smith, Assistant Professor in School of Architecture from University of Utah. Its content is a detailed elaboration of the three principles of bus stops thus listing and describing the elements to be considered when designing a bus stop.
**Weather**  
- High angled hot summer sun  
- Cold of the winter  
- Rain and snow  
- Natural and traffic generated wind

**Location**  
- Proximity of the shelter to the street  
- Location of the shelter in relation to the sidewalk  
- Height of the shelter  
- Size of the shelter  
- View corridors from and around the shelter

**Access**  
- Disabled access from park and ride, and sidewalk to the stop  
- General access from parking, sidewalk, or street to the stop  
- Transition from other modes of public transport (i.e. subway, train…)

**Lighting**  
- Safety of riders  
- Maintenance of lighting  
- Renewable energy source  
- Visibility of signage and bus route information  
- Identification from afar

**Surfaces**  
- Friction of ground surface  
- Durability of pedestrian surface traffic  
- Ease of snow removal and cleaning  
- Water drainage  
- Variety in surface treatment  
- Vegetation

**Human**  
- Places to sit  
- Places to stand  
- Places to lean  
- Proximity to other riders  
- Bus route information  
- Enclosure/refuge  
- Prospect/visibility of surroundings

**Amenities**  
- Next bus information  
- Trash Holder  
- Phone/Internet Access  
- Ticketing
Other
- Splash from vehicles
- Vehicle exhaust (including from buses)
- Vehicle noise (including from buses)

ADA and Universal Design Requirements for bus shelters

The American National Standards Institute guidelines have laws and regulations intended to eliminate certain physical barriers that limit the usability of environments for people with disabilities. The Americans with Disability Acts (ADA) Standards are the minimum requirements that comply with the law. They are not necessarily “best practices.”

Universal design, on the other hand, is intended to create environments that are usable by all people. While considerations for people with disabilities are necessary for universal design, they are not sufficient when planning and designing for all people.

Therefore, the merging of both ends should result in a list of requirements that is accessible to older adults and people with disability, which is at the same time accommodating to all riders. (Nelson & Easter Seals Project ACTION, 2001)

Bus Shelter Design

A bus shelter provides protection and comfort for riders while waiting for a bus.
Also, a shelter marks a bus stop, supplies an area to post route and timetable information and provides refuge for waiting riders, separated from traffic, passers, and bus landers (a flat area of concrete). Also, shelters located in areas with good lighting and visibility from and to surrounding areas enhance the safety of the stop.

Some guidelines to improve the bus stops would be to include transit route maps, schedules, and seating inside the shelter as well as to make sure the room is spacious enough to fit seated and non-seated waiting riders. Also Maps and schedules should be easily readable by persons using wheelchairs and, to the greatest extent possible, persons with visual impairments.

Omitting steps between the sidewalk/bus pad and the shelter also improve the bus stops as well as maintaining a door opening of minimum 36 inches for people on wheelchairs.

Typically, a shelter is constructed of clear side-panels for visibility and safety. However, these panels should be marked to indicate their presence. Shelter design and material should be based on criteria related to climate, durability and maintenance. Also, heating and cooling systems should be used inside the shelter to account for all weather conditions.
The decision to install a shelter at a bus stop is based on the number of riders boarding from the stop. The estimated number of boarders in rural areas is 10 per day, 25 per day in suburban areas and between 50 to 100 riders per day in urban areas.

**Bus Stop Area and Bus Landing Pads**

A bus stop platform is a flat area clear of obstructions and obstacles to facilitate boarding and landing for all riders.

A firm, stable and non-slippery surface the length of the bus provides a comfortable waiting, aligning and boarding area for both front and rear doors. Wheelchair and scooter users require a flat area and more space to wait and turn around than other transit riders.

**Lighting**

Good lighting can enhance a waiting rider’s sense of comfort and security. Poor lighting may encourage unintended use of the facility, especially after hours.

Riders who have low visibility in dimly-lighted areas benefit from good lighting at and around the bus stop. Multiple sources of light are more resistant to vandalism and provide illumination that casts fewer intimidating shadows. However, lighting that is too bright in
bus shelters can also compromise personal safety, so the rider can easily be seen by others but cannot see outside.

Security

From the perspective of security, landscaping, walls, advertising panels, and solid structures can restrict sight lines and provide spaces to hide. Landscaping elements should be limited to low-growing shrubbery and ground cover. Also, the bus stop should be visible for approaching bus drivers and passing vehicles.

Most importantly, a Pay Phone or Police Call Box should be available in case of emergency. The boxes must be suitable for all users including people with hearing impairments and those using a wheelchair.

Accessible Path

Walkways or sidewalks are essential links between the origin/destination of the trip and the bus stop.

Walkways and bus stop areas should always be clear of snow, ice and other debris.
The use of different textures, such as concrete, paving stone, contrasting colors, tactile strips and curbs help accommodate people with visual impairments.

**Street Furniture and Other Obstacles in Travel Path**

Locate street furniture and signage, such as benches, sign posts, newspaper boxes out of the walkways. Grade-level changes are difficult for older adults and people with disabilities. Any grade-level change without the aid of a curb ramp creates a mobility and accessibility barrier.

**Route and Timetable Information**

The information should always be updated when changes are made to routes and schedules.

Consider the quality and appearance of information being displayed. Make the displays permanent and updatable.

Route and schedule information should be part of the design shelter so it is not added in places that reduce visibility or security.

Real time information display boards provide riders with up to the minute information on bus arrival times and delays. Reducing ambiguity in terms of arrival time and route
allows those with cognitive disabilities and general transit riders to use the system more effectively.

Also, for people with visual impairments, a button may be provided that gives audio information when pressed.

**Transit Signage**

Signs are a source of information regarding the location of the bus stop. They are also excellent marketing tools to promote transit use.

Letter styles, sign appearance, and color choice should be unique to the transit system so that people can immediately identify bus stops. The information on the sign should be legible, clear and consistent at all stops for all people including those with disability.

Transit signs are usually installed in an accessible position on the bus stop landing pad not obstructed by trees, buildings or other signs. In addition, making the sign double sided and illuminated also provides easier visibility during all hours of the day.
Benches

Riders who have difficulty walking and standing find the benches very useful when waiting for the bus. Avoid installing the bench on the wheelchair landing pad and make sure there is enough waiting room near it.

The material of the bench must be weather proof. Metal for example is a very commonly used yet undesirable material since metal seating surfaces get very cold in winter and very hot in summer.

Public telephones

Telephones give the ability to make personal and emergency calls while waiting for the bus.

Where public telephones are provided, at least one telephone should be accessible by people using wheelchairs and people with hearing and visual impairments.

However, experience with pay phones at bus stops has given mixed results. For example, inclusion of phones at bus stops can create opportunities for illegal or unintended activities, such as drug dealing and loitering, compromising the safety in and around bus stops.
Therefore, separate the phone and the bus stop waiting area by a short distance and remove the return phone number attached to the phone.

**Maintenance of Bus Stops and Shelters**

Maintenance is crucial to establishing and maintaining a barrier-free bus stop environment.

However, bus stop maintenance can be costly and time-consuming. Working agreements with local businesses or commercial centers can reduce the financial responsibilities of the transit agency or public works department.

For example, Tri-Met in Portland, Oregon compensates its Adopt-a-Stop participants with ten bus tickets per month for maintaining their stops. More than 800 bus stops within Tri-Met’s service area have been adopted, and litter reduced by 80 percent through the program.

**Key Players and Agency Coordination**

Since some bus stops and walkways are located on public property, several players are involved in the construction, improvements and maintenance. Therefore, partnerships
between the transit agency, the public and municipal departments are valuable in providing accessible and safe bus stops.

Also, transit agencies can seek partnerships with the public works departments, city/municipal offices, businesses and developers, and general public.

Partnerships with the public can be helpful in maintaining stop accessibility. Through programs such as the previously-mentioned Adopt-a-Stop, the public can assist in the maintenance of the bus stop by agreeing, for example, to pick up litter, clean the stop amenities and report any items needing repair.

**Interdepartmental Collaboration**

In addition to cooperating with outside sources, bus stop improvements can be better facilitated if there is a strong organization inside the transit agency.

For example bus operators are often well-informed about safer locations for pulling over or whether riders are facing any problems at a specific bus stop. Such information should be shared with the transit planners to enhance and improve on the experience of bus system.
History of Columbus in Transportation

Columbus has an old history of trolley cars dating back to the 1800s up until the mid-1950s.

The Columbus Street Railroad Company was first formed in 1854, with the first streetcars pulled by horses in 1863.

In 1888, the first electric powered streetcar was launched; however, lack of investment in maintenance was the end of this system.

Later in 1926, Columbus’ streetcars were eventually abandoned in favor of diesel buses (and gas-powered cars), but the transition also included electric trolleybuses, powered by overhead lines. The latter were discontinued after 22 years.
The effective switch to buses powered by electricity or gasoline began in 1933 and was completed in 1948.

Finally from 1974 until now, the Columbus Transit Co. became publicly-owned and named COTA which stands for Central Ohio Transit Authority.

*COTA for Older Adults*

Recently COTA has been trying to diminish the usage of its Para-transit by encouraging older adults and people with mild disability to use its regular services. By doing so, this will reduce the division of financial expenses and allow COTA to focus the budget more on enhancing their regular services.

They started by giving 50% discounts to older adults and people with disability. Also, they rerouted some of their trips to reach the basic required locations older adults need, like hospitals, grocery stores, malls, senior centers (…). Such developments are a work in progress. However, COTA still needs to do more enhancements to cover all the required destinations.

Also COTA provided these people with different ways to obtain information and even assistance concerning trip planning, traveling, bus routes and time schedules. Some of these amenities are direct call numbers, online information, catalogues, and brochures.
In addition to that, a mentoring program was launched last year to escort and teach new riders how to use the COTA system. People need to register for that in advance and the escorting part usually lasts for a few weeks, until the new rider feels comfortable enough to travel alone.

Despite all that, the percentage of older adults who rely on COTA as their daily transportation is still very low. This leads us to the problem being addressed in the study. Further details are discussed in the next section.
CHAPTER 3: Study

Section 3.1: Description of Study

Research Question:

What are older adult’s requirements for accommodations and assistance when using public transportation?

Premise:

There is a missing link between older adults and accessible public transportation. People’s dependence on driving caused a lot of neglect regarding the enhancement of public transportation in Columbus, OH. This resulted in the deterioration of the public transportation system which indirectly created a misperception regarding its importance and usefulness.

The increase in life expectancy for older adults along with maintaining their quality of life after retirement is partly based on their capability to keep driving in order to stay
active. However, as people get older and their senses diminish, driving becomes a hazard for them and for the people on the streets.

The solution to this is to find alternative means of transportation where older adults are not required to drive and yet still maintain their independence. This alternative should be inexpensive for older adults and affordable to the city’s budget. There are 3 different motorized ways of transportation in Columbus:

- Individual transportation, such as cars or motor cycles.
- Taxis.
- Public bus transportation.

Taxis are the closest to individual transportation. They can transport the person from and to any destination during any time of the day. However, taxis can be very costly hence not an appropriate means for daily transportation.

This narrows it down to public bus transportation which in Columbus, OHIO is COTA (Central Ohio Transit Authority). COTA provides 2 bus services: mainstream and local. Mainstream buses also act like individual transportation and taxis, but they can only be used by people with disability. As for the local buses, they are the ones accessible to all people and have specific schedules and routes. Hence, this study emphasizes local bus transportation as the ideal alternative means of daily transportation for older adults.
Accordingly, the focus of this study is to locate the gaps and lacks in COTA’s local bus service by interviewing older adults and professionals in the field of public transportation. The final aim is to highlight these gaps and lacks and provide suggested solutions for future Design professionals to tackle.

Participants:

In the first study, a questionnaire was filled out by 45 older adults. The second study consisted of a one on one interview with 7 older adults who were randomly chosen from the first study. The elderly participants were 65 years of age or older, local citizens, independent and self-reliant.

In the third study, a one on one interview was conducted with 4 professionals in either one of these fields: public transportation, gerontology, or navigation. Their personal input and professional expertise revealed a different point of view to the study and provided a better understanding of the transportation system and the way it functions.

Recruiting Process:

The elderly participants were recruited in person from three different senior centers.
The advantage of these centers, as shown in figure 8, is they are from 3 different regions. This enables me to collect data from different regions of Columbus which in hand will provide more accuracy to my study and answers that will serve the majority of local residents.

The elderly participants willingly volunteered to do the questionnaire and the interview after a briefing and explanation of the study.

As for the professional participants, they were either in my professional network or referred to me by other professionals.
Section 3.2: Methodology

All three studies were conducted in order to reach a thorough understanding and to
generate many possible solutions to the problem at hand. Also, these studies occurred
during the summer season since elderly centers open only when the weather is warm and
safe for older adults to go out of their houses. At other times, they are closed.

In addition, all interviews were audio recorded and saved for qualitative data analysis.
The participants signed a consent form prior to the research.

In the first part of the study, elderly participants filled out a questionnaire that took
approximately 30 minutes to finish. The questionnaire included open-ended and multiple
choice questions regarding the participants’ current status (age, marital status, gender,
living conditions) and personal opinion about different features of public transportation,
COTA bus stops, and trip planning. A sample of the questionnaire is found in the
appendix.

In the beginning of the questionnaire, the elderly participants were given the choice to
provide their contact information. Based on that, the random selection for the second part
of study happened. I personally contacted the elderly people who provided me with their
contact information and asked them for a one on one interview.
The interview took around 60 minutes. The interview was informal, using a topic guide to organize the flow of the conversation. To help control the conversation, there was a set of cards and a chart which included visuals and guidelines about public transportation and bus stops (See sample in appendix B). In addition to that, the cards and chart acted as reminders and triggered elderly’s memory regarding this topic.

The discussions in the interviews expanded on the questions from the questionnaire and built upon the answers they gave before. Such an approach provided the elderly participants with the opportunity to express themselves in more depth and share more of their opinions. Several ideas came out of these discussions. Some ideas were addressing and discussing problems in either the physical or service aspects of COTA. While other ideas were more developed and resulted with potential solutions to some of these problems.

All these problems and solutions were gathered and used in the third part of the study during the interviews with the professionals. Professionals from the gerontology, transportation and COTA participated in a one on one interview after agreeing to share their thoughts about the topic. These interviews were also open-ended discussions and each interview was focused more on the professional’s expertise and knowledge. In addition to describing their roles and opinions towards this subject matter, they also commented on the solutions and opinions from the elderly participants. The general
outcome of these interviews revealed a more profound understanding of the subject matter.
CHAPTER 4: Analysis of Studies

Section 4.1: Elderly Questionnaire

The first study was a questionnaire containing both multiple choice and open ended questions. The inquiries were filled by 45 elderly participants. However, since they had the choice to skip questions, not every question had 45 answers. Therefore, the calculations in the following tables and graphs will vary according to the total number of answers given for each question. Also, the color coding used in this analysis for transportation (blue) and trip planning (purple) is consistent throughout all the studies. The general status that was only in the questionnaire is in red and green.

The type of information collected from this first study is quantitative data and its purpose is to describe the status and state of the elderly participants and to assess their opinions towards bus stops, public transportation, and trip planning.

The status and state of the elderly participants (figure 9) shows a well-varied sample of elderly Columbus citizens. More than half of the elderly participants were between ages 64 and 75 while only 15 were of ages 75 or above; 4 of them however did not specify
their age. As for their genders, there were 24 females and 18 males and 3 decided not to specify.

Based on their current state, more married participants filled the questionnaire and only 11 people said they were single. Also, there were 14 participants who checked the “other” choice and labeled it as “widowers”. In addition, there were almost the same number of participants who lived alone as those who lived with their spouse. As for the 6 left, they either lived with family or in care facilities. However, most of the participants travel alone during their regular daily trips outside the house while the rest go out with either their spouse or another companion.
Concerning their daily means of transportation, the majority of elderly participants initially depend on their own personal cars. In addition, when asked about their secondary means of transportation most of them also said cars. This proves how much Americans, and in this case, older adults from Columbus are dependent on their cars as we have discussed in previous chapters.

The second part of the questionnaire was about trip planning and navigation.

As discussed previously, navigation is the process of way-finding, orienting and way-following towards any destination. The more familiar the person is with the environment, the easier it is for them to navigate. However, some people are more way-finders than way-followers and the opposite is also true. Therefore, figure 10 shows that most elderly participants identified themselves as way-followers rather than way-finders and very few of them believe they were both. Such information means that older adults prefer to follow step by step directions rather than figuring out the way on their own.
Even though most of the elderly participants were way-followers, still almost half of them don’t plan their trips ahead of time and the majority doesn’t go out with support, see figure 3. This links back to the independent spirit current older adults have in U.S.A. in general and Columbus in particular. However, almost all of them don’t mind asking for help when lost.

Before they get lost and despite them not planned ahead of time, this part of the study emphasizes that these elderly participants are way-followers. As shown in figure 12, the first option older adults chose as a way to get directions was by asking. Whether asking people around them or policemen, they prefer being told exactly where to go and being pointed to the right direction.
From that, the third part of the questionnaire was to examine elderly participants’ familiarity with COTA (Central Ohio Transit) and their view towards the different elements present at its bus stops.

The figure above shows that only 19 older adults believe that COTA is a daily life necessity. However, a total of 30 participants have either used COTA several times or even stopped counting the number of times they have used it. Still, 17 of the elderly participants are non-COTA users and that is because the majority of them are dependent on their cars as we have seen in the first part of the questionnaire.
Moving on to the last set of questions, the elderly participants were asked to evaluate the current features of COTA bus stops and label them as either “good”, “fair”, or “poor” (figure 14). The best 3 features in the good category are “sign visibility” with 22 votes. After that is “shelter safety” and “map content”. “Bench accessibility” got the highest number in the fair category then came “weather compatibility” and “schedule”. As for the poor category, it is “lighting”, “shelter safety”, and “map content”.

The evaluation of the COTA bus stop features was used to guide the second study. All the features mentioned in figure 14 were discussed in the elderly interview.

![Symbols of essential features deduced from questionnaire](image)

Figure 15: questionnaire: Symbols of essential features deduced from questionnaire.

Section 4.2: Elderly Interview

The second study was a one on one interview with 7 elderly participants who were chosen from the first study. There were no pre-assigned questions, only general topics that needed to be covered. This gave the elderly participants enough liberty to fully express themselves and provide their own personal opinion on the subject matter.
The type of information that was collected from this second study is qualitative data and its purpose is to further explore bus stop design problems and suggest alternative solutions.

In order to better manage and analyze the information, a set of cards (see appendix B) containing random pictures of different bus stop elements were used during the interview to help trigger the elderly participants’ thoughts and ideas. Each interview took around 60 minutes and it was audio recorded for analysis.

The analysis of the second study was divided into 2 main topics: process and bus stops. The process category is about trip planning and directions that is provided at the bus stops. The bus stop category deals more with the visual elements existing at the bus stops, such as shelter, sign, map, schedule and lighting.

Figure 16: elderly interview: Design elements of bus stops.
Figure 16 is the representation of any bus rider’s journey going from one destination to another and back. The journey goes two ways, it starts from the place of initiation and finishes at the final destination and then vice versa it starts again at what used to be the final destination and finishes at the starting point. The link between the start and finish is the bus and the bus stops grant us access to that bus. The bus stop category is directly linked to the elements and items required to exist at a bus stop. The highlighted elements are the most mentioned during the questionnaire. This elderly interview provided the opportunity to concentrate on these elements and discuss their problems and solutions.

**Sign:** Starting with the sign, 3 of the elderly participants emphasized the need of having a phone number, bus number and its final destination as information present on the sign. Also 2 participants described the bus sign as having to be simple, inviting, colorful and easy to read. One elderly participant suggested that a certain visual aid should be present to help easily distinguish and identify the bus stop from far distances.
People: People refer to other bus riders or passersby. Five of the elderly participants wanted to avoid facing people or being bothered by loud or chaotic strangers. However, one participant said she feels safer when there are people at the bus stop. Another participant is also not bothered by people since they are mostly working people or students.

Bench: There wasn’t much to discuss when it came to benches. All elderly participants insisted on having benches at all bus stops, even if there were no shelters. One elderly participant described wanting the bench to have a back rest, because she always felt they were not too comfortable. Also, another participant mentioned that using metal for benches turns its surface to an oven during summer and a cooler in winter the season.
**Shelter:** Most elderly participants prefer finding a shelter at the bus stop to protect them from all weather conditions. As we went into the details of the shelter, 2 participants suggested closing the opening at the bottom to protect from wind, cold and water splashing. Another 2 participants recommended making the walls of the shelter transparent for safety reasons. That way they are more aware of what is happening around them. One participant suggested adding solar energy to install fans and heaters inside the shelter. Finally, one participant found that spacious bus shelters are better for ventilation and maintaining personal space.

**Map:** Concerning the map, the discussions were more about its content. 3 elderly participants prefer reading street names on the map rather than landmarks, compared to only one elderly participant who said the opposite. Also, one person mentioned that he
prefers seeing how much time it will take to get from one stop to the other. In addition, two of the participants suggested the use of technology and a digital board.

Schedule: Most of the participants’ answers were unanimous. They mentioned how the bus is supposed to come on time and if there were any changes in schedule then COTA should notify the riders beforehand. As for the design of the schedule, most of the elderly participants said they prefer foldable schedules with legible font. Also, a digital board with real time arrival was suggested.

Weather: All weather conversations were about the winter season. 3 out of 6 participants use public transportation during harsh weather or winter season. One person said during bad weather, she calls Senior Option (private bus transportation) for grocery shopping or
doctor’s appointment (…). One other participant complained about the hassle of putting her big boots on in order to reach the stop.

**Lighting:** Even though lighting took the highest votes in the poor category in figure 13, the elderly participants did not elaborate much about the topic during the interview. 3 of them said the bus stop should be very well lit. While the other 2 said they don’t use public transportation at night.

*Figure 17: elderly interview: Design of the system.*
The analysis that came out of the interviews with the elderly participants reveals more about the design of the whole transportation system and the way the experience of the trip is or should be. As shown in figure 17, these analysis were categorized between trip planning and directions. Directions involve anything related to navigation. Trip planning is the process of preparing and organizing for the trip.

Trip Planning: Each elderly participant had their own way to plan for their trip. 3 of them said they call COTA’s customer service and ask for assistance. Another 2 said they would ask friends who already know where the destination is. Two of the participants plan a day ahead by getting all the necessary information online. On the other hand, 2 others simply ask the bus driver, which is a last minute plan.
Directions: This part of the conversation involved navigation and environmental cognition. Six of the elderly participants from the interview were way-followers and a few said they were both way-followers and way-finders. One of the participants however believed he was a way-finder simply because he doesn’t know whom to ask for directions. As for environmental cognition, 4 of the elderly participants prefer getting directions through landmarks since they can easily memorize them. However, 3 of the participants said when it comes to public transportation, they prefer getting directions through street names because it makes the process much easier and consistent. 2 other participants said they don’t mind wandering around on the streets to find their destination. Finally one participant said that she usually draws a diagram to the destination and keeps it in her purse for backup after she has visually memorized it.

Looking back at all the information and ideas suggested, we notice that the elderly participants’ recommendations did not go beyond any of the ADA or universal design requirements that were mentioned in the previous chapter.

At the end of every interview, the participants were asked whether they would be more dependent on public bus transportation if their perfect bus system existed. Surprisingly enough, most of them said no, they would still prefer using their cars. Their belief is that the public bus transportation is mainly for lower class people. This latter finding initiated the third study.
The purpose behind the third study was to integrate a professional point of view and provide a better understanding of the transportation system, the way it functions, and people’s perceptions towards it. Therefore, every interview started as an information-gathering session, but in the end it switched to a brainstorming session for possible ideas and solutions.

A one on one interview was conducted with 4 professionals. Each interview lasted for almost 2 hours. One of professionals was a gerontologist, another was an expert in navigation, and the last two worked for COTA. Each interview was analyzed separately because of the professionals’ different types of expertise. Still, each interview revealed insightful information regarding either the public transportation as a system, or the people influencing its progress.

Linda Mauger:
Linda is a Gerontologist at The Ohio State University, a board member at COTA and a city council member in Upper Arlington, Columbus.
Figure 18: professional interview: Words used during the conversation with Linda Mauger.

Between her expertise in Gerontology and involvement with COTA, several topics were discussed during her interview.

Linda believes that there are several concerns for older adults in public transportation. In her opinion, older adults will always wish to continue driving. However, there’s a perception that they can do that although that’s usually never the case. In Columbus, it is going to take years to change the elderly’s perception. That is why it would be better if we started addressing this issue immediately to start building a generation of acceptance towards public transportation. For example, with the increase of gasoline prices, the COTA ridership increased and it has not fallen off ever since. Therefore, once some people get the COTA experience, they realize the benefit of it and keep using it.

“Reality is, it is less expensive to use a taxi rather than drive a car; no insurance fees or gas or worries.” Linda Mauger
COTA is working really hard on changing the culture and people’s perception through vibrant visual designs and hybrid buses. However, the problem is not just in the visual designs of COTA; there is the service that needs enhancements too. Therefore, solving only one aspect of it will not be very influential.

Some strategies can be used to enhance the experience of public transportation. For example, in New England, there is a transportation system where a person can buy a prepaid card and use it instead of cash. This decreases the anxiety of always having the exact change. And it also takes away the image of spending money. More of Linda’s suggestions were book readings on the bus or discussion groups about current general events. Also installation of public art and talking about it during a bus ride or at the bus stop can also be another example.

Also there is a need to build more sidewalks and bi-passes to provide better access to bus stops. The city is not always the one responsible for building sidewalks; it is usually the developer of the area that is expected to install sidewalks. Regardless of that, the city is trying to build them on its own expense in order to encourage people to walk more and be active.
Scott Lissner:

Scott is the ADA coordinator at The Ohio State University. He is also in the advising committee at COTA.

We started the interview talking about the ADA standards and he said that the ADA provides only the basic level of compromise. It is certainly not the answer for everything and public transportation in Columbus is a good example of that. He then added that the ADA depicts how a bus stop is supposed to be built, but this doesn’t mean it is obligatory to build it in that way. COTA has met the ADA standards.

He then added that COTA is enforced by the Department of Transportation not the city, as most people think. Still, COTA is providing a service and transportation accessibility to the city, so if they needed to build sidewalks or get more financial support, they can negotiate with the city. As an example, he said, COTA is expected to be cost effective and efficient, so they depend on other sources, like the city, to build sidewalks. On the
other hand, the city responds by saying if COTA was planning on putting a bus stop then why not build the sidewalk along with it. Hence the dilemma lies more on who should do the enhancements rather than how it can be done.

“I think everybody points at everybody else.” Scott Lissner

Scott also discussed several issues related to the public transportation system and the way it functions. He mentioned that the U.S.A. lost most of its public transportation system around 1940 when the government decided that automobiles should become the number one means of transportation for the individual. So they started building highways and stopped spending money on trains and tracks. So now it is believed that more people can be moved through individual transportation. However, in order to reverse that, public transportation should become accessible to everybody, through better schedules and more routes. For example, the metropolitan area of Columbus is 65 square miles and only 20% of it is effectively reached by COTA. However, the public transportation system cannot work if there isn’t enough ridership. This makes both the system and the people dependent on each other. Therefore, we also need to work on ridership which means changing people’s perceptions towards COTA.

Then he started considering that older adults are most likely not going to find COTA convenient especially if they had been driving all their lives. Also, people perceive
COTA riders to be poor commuters. Therefore older adults will try avoid using COTA and find another mean of transportation.

“Give people the impression of a different experience of using public transportation. A change!” Scott Lissner

People are not used to planning their days around the bus schedule. Also, public transportation takes a longer time to get to a destination compared to a car. Therefore, we have to make the wasted time on the bus more efficient and convenient. According to him, when he looks at other successful systems in other cities, he notices that they have done something that makes this transportation seem less traditional. For example, Long Island, New York, created a program called MBA on wheels. It started when a university noticed the high number of its student commuters. So they created an MBA class that would last throughout the trip. The program was very functional and lasted for several years. Finally, another approach could consist of having book readings or book clubs going on in these buses.

“For a system to succeed there should be a change in people’s perception towards public transportation.” Scott Lissner
Edward Mcganis:

Edward is the Director of Marketing at COTA. He is responsible for promoting ridership.

Figure 20: professional interview: Words used during the conversation with Edward Mcganis.

The entire interview with Edward was about the assessment and future plans of COTA. He started by saying that marketing is to change people’s beliefs or perceptions.

Everything that they do or plan is all an attempt to try and change people’s perception towards using public transportation. He added that before, COTA did not have a very good image which created fear and uncertainty. The elderly population still has this fear, but they are working on changing that in the next 5 years.

They started by eliminating all the outside and inside advertisements so that the buses and bus stops would look cleaner and safer. According to the survey, riders did notice this
change and it created a very positive impact. So if COTA continued applying these enhancements, then older adults will start seeing that.

The schedule and map are historic designs that they’ve used for years. However, they are trying to look into other designs and other kinds of material for better legibility. Also they are working on enhancing the map and bus routes. In the near future, COTA is planning on adding digital boards for real time scheduling, changing their 1970 signs, and installing solar system in their shelters for lighting. There are also initiatives to put cameras in the bus shelters for safety. However, to do that requires a lot of funding and equipment. They have 4300 bus stops and maintaining them is already a challenge.

Edward had other comments about the COTA system. He talked about street maintenance groups that maintain bus stops and their visibility. He said most of these maintenance should come from the community. People should be more engaged and should tell them if there was anything that needed to be fixed or changed. As for lighting, they work with communities. One example is placing the street light next to the bus stop. Also, drivers are being trained to handle critical situations and they have included silent alarms in all their buses for emergency cases.

Concerning older adults, they are working on a nurturing program where they train active older adults to become mentors who can familiarize other older adults with public transportation and the way it functions. In the past few years there have been a lot of
complaints about young people disturbing the calmness of the bus and older adults are feeling threatened.

He later added that the biggest problem that COTA is struggling with is sidewalks. Without them, older adults and all people are finding it difficult to get to the bus stops. Lack of sidewalks and even bad sidewalks are causing a lot of discouragements and hesitation from people to use the public transportation.

Doug Moore:

Doug is the VP of Planning and Development for COTA. Hence the entire conversation focused on the COTA system and the way it functions.

Figure 21: professional interview: Words used during the conversation with Doug Moore.
He started by explaining that COTA has 3 horizons for planning:

- 30 year range plan. They create a concept of what transit might look like.
- 5 year plan. This covers all the actual service improvements from routes to hours of service to new technologies.
- Short term plan. This covers all the small changes and enhancements happening at COTA such as schedule changes. These changes happen every 3 months.

The decisions they take for the 5 year and short term plan are influenced by riders’ opinions. Doug said that COTA conducts random surveys every 3 months. These surveys are either filled out by riders on the bus, or through public meetings.

“Instead of me sitting behind my desk and making assumptions, we prefer knowing the public’s input.” Doug Moore

Then he said that it’s hard for COTA to plan ahead for older adults because they don’t know where they are going to live. What they can do is educate building companies who are building residences for older adults and try to accommodate the elderly riders as much as they can.
COTA has a program where older adults who have mobility challenges get to ride COTA buses for free. However, according to Doug, the main issue for older adults is how technologically savvy they are. COTA is planning on digitizing its services from online trip planning to texting services for real time schedule.

As for the education part, COTA tries to influence building companies to consider several factors if they are expecting public transportation to be provided. One of the major things is to place the parking lots behind the buildings and put the buildings close the road so that people won’t have to walk too far from the building gate to the bus stop. Another tip is to design the buildings to be close to each other and close to the main road so that one bus stop would serve a bigger number of people.

Doug stated that COTA’s biggest challenge is sidewalks. He said that they are not in the business of building sidewalks, but they try their best to set the bus stop close to a sidewalk or a concrete pad.

“If you created an environment where people can walk to their destinations, then you have provided a better transit system.” Doug Moore

Doug believes that there are certain perceptions in the U.S.A about the people who ride buses. For instance, people prefer using the subway rather than buses because buses are
perceived as second class transportation. Also, trains have more convenience over buses especially when it comes to way-finding.

Such perceptions also affect the community leaders. COTA has never been funded very well because community leaders don’t see bus transit as a viable option. They see that providing more parking is more successful than supporting public transportation. This limits COTA from expanding and providing better services. Still, COTA is trying its best to overcome this perception.

*Analysis:*

There were two major topics that got answered in all 4 interviews: perception and sidewalks.

All of the professionals complained about nonexistent sidewalks and the lack of financial support to build them. As Scott said: “Everybody points at everybody else.” One thing is for sure, they all believe that it’s not COTA’s responsibility to build or pay for sidewalks. However, the responsibility lays on the city, transportation authority/community leaders, or building companies. Hence COTA’s system is somewhat reliant on these ‘leaders’.

Although the professionals considered sidewalks as a major concern and the biggest inhibitors to the development of COTA, yet none of the older adults mentioned this as a
big problem in the first two studies. This shows a miscommunication and misassumption between COTA and the people.

On the other hand, the perception that people have towards public bus transportation as being for lower class people was briefly-mentioned in the second study and emphasized in the third study. This misperception is the major problem.

If people keep thinking that COTA is for lower class people, they will definitely feel discouraged from using it and stay dependent on their cars. Such actions will support the city’s decision about having cars as the main daily transportation. This will decrease people’s support for COTA. As COTA is already running on very low budget, lack of support will limit its development and prevent it from taking proper actions to change people’s perception. This shows how interconnected the issues are.

Section 4.4: Summary:

The summing up of all three studies defined the necessary bus stop accommodations requested by older adults and also built a better understanding of how the COTA system functions. Studies 1 and 2 had a direct connection with older adults. Especially in the second study, older adults took the liberty of fully-expressing their needs and suggesting their ideas. As for the third study, it helped reveal the gaps and emphasize the problems in the COTA system.
The results of all 3 studies are represented in figure 22. The rectangular cycle is a representation of the information gathered from the third study; color black. All the symbols and information within are from the first 2 studies; colors blue, purple, green and gray.

Most of the symbols are the same as in study 2. Each symbol is strategically placed according to which quadrant it belongs. The keywords clustered around each symbol are the comments and ideas provided by older adults in study 1 and study 2. As noticed, the
symbols are mainly clustered in the upper right quadrant. This is because the focus of the study is on bus stops. Comparing these keywords to the requirements from Chapter 2: Daily Transportation: ADA and Universal Design Requirements for bus shelters, there are a lot of similarities especially with the universal design requirements. This proves that the enhancements older adults have suggested for public transportation will not just be accommodating for them but also will benefit all generations. After all, public design should be universal in order to be compliant with the majority of people using it.

Figure 23: summary: The pathway of a journey.
The best way to understand the flow of these symbols is to start reading them from the “Riders“ corner and go counter clockwise as shown in figure 23. This is the representation of a journey using public transportation. The pathway starts with the rider heading to the bus stop where they take the bus which drops them off at another bus stop and this takes us back to the rider. Several encounters and actions occur throughout this journey, but it’s not necessary to experience all of them. For example, we have learned from the first study that some elderly riders plan for their trip ahead of time while others wait until they get to the bus stop (see figure 11). This explains having the trip planning symbol present in the beginning of the pathway and inside the bus stop quadrant.
Figure 24: summary: The COTA system.

The cycle part of the figure comes from study 3. As shown in figure 24 it rotates clockwise and makes a continuous loop. The analysis of study 3 shows that the COTA system is dependent on 2 other factors for its success and development: the riders and the city. Also, 2 major issues were revealed in the summary of study 3. One of the problems has to do with the misperception happening between the riders and COTA. The riders believe that COTA is only for lower class people while COTA’s assumption is that the riders’ major challenge for using their transportation system is the lack of sidewalks. Also, COTA expects the city to provide these sidewalks.
Therefore, if we wanted to understand this figure we can start from the upper left corner. COTA is required to maintain and enhance the bus stops so they would be more accessible and accommodating to the biggest number of riders. This will cause an increase in the number of riders which will prove that COTA is a necessity and hence indirectly compel the city to give more attention and show more support to COTA.

This confirms that the 2 key players in this cycle are COTA and the riders. If COTA manages to listen to the riders’ actual needs and provide all the necessary accommodations, then the riders will change their opinion, increase in numbers, remove the stigma about COTA and depend on it more often. This in turn will prove to the city that COTA has become a necessity and requires more support.

Hence, the actual core problem and biggest gap in the transportation system is perception. So it got placed in the center of figure 3 to show that all the changes and developments should work towards improving COTA’s perception towards riders, which will affect riders’ perception towards COTA. Once this issue is solved then the rest will follow easily.
CHAPTER 5: Conclusions

The initial purpose of this study was to identify older adult’s needs and wants for better accommodation at bus stops to encourage them start using and depending on the public bus system as an alternative mean of transportation. As it turns out, older adult’s requirements were not that different than the regular ADA and universal design’s rules and regulations on bus stops. This meant two things. First, older adults are capable of using the current COTA system; since COTA does follow the ADA regulations and have some of the universal design requirements. Second, the problem for older adults’ not using public transportation has nothing to do with the elements present at a bus stop or bus system, but rather the problem is the perception towards the bus system itself. Apparently, based on the professional interviews, this proves to be an all generations’ problem.

Even though the core problem for people not using COTA was their perception towards public system as being for lower class people, still COTA’s attempt to solve this matter is at a very slow pace due to lack of funds and support from higher authorities.
All these findings were possible because of the way this study was constructed. The structure of the study was general enough to allow alterations and freedom of expression and yet specific enough to keep it contained and focused on the subject.

The questionnaire was specific and direct to the point that it established solid foundation for the study. As for the interviews, they were the building block and development of the foundation. Such structure makes the study repeatable and applicable to any other study related to public bus transportation.

On the other hand, the limitations of this study were time and resources. Such expanded study should be conducted on a long period of time with more participants involved especially in the older adults’ and professionals’ interviews.

Another limitation is control of conversation, especially with older adults. During the interview, older adults had the constant tendency to drift out of the topic being discussed. Conducting an interview with them, one must be very patient, attentive and not hasty to get back to the topic. Sometimes listening gave the elderly participants a chance to think and rewind their thoughts.

However, the only obstacle faced throughout this study was encouraging older adults to complete the entire questionnaire. According to the questionnaires that were filled, it
seems that older adults preferred more direct multiple choice questions over open-ended ones.

Benefits:

The whole intention behind this thesis was to provide a source of information for designers. As noticed, the research present in the literature review part was gathered from several reliable sources and additional information was also cited in the appendix and bibliography. Some of the information is directly related to the study like public transportation and older adults while the rest is associated with the topic like universal design, environmental psychology, and public space. Therefore, this thesis is not just about the study and its analysis, but its importance is also on the literature review and references.

Section 5.1: New Frame Work:

The analysis of the study resulted with a list of gaps and problems along with design ideas and solutions to consider for future research.

The next step after this research, which we need to focus on, is perception; mending the missing bond between COTA and people which is leading to the previously mentioned miscommunication and misperception.
Another step is to work with industrial designers, gather all the information found in figure 21 and create the ultimate or perfect bus stop for older adults. One important aspect also is to integrate material, costs and sustainability within the design.

COTA believes that they are designing according to riders’ requests taken from their surveys and group meetings. This proved not to be successful in study 3: Professional Interviews. Therefore a new approach needs to be studied and researched so that COTA could create an accurate and exchangeable means of communication with its riders.

Another idea would be to conduct the same study in several cities in USA and compare results. The purpose behind this approach is trying to identify what is working in other cities and maybe adopt it as a solution for COTA and whether this stigma is present in all USA cities and what possible solutions can be suggested.

Last potential topic, which will be further discussed in the following paragraph, is changing people’s perception towards COTA; eliminating the stigma of it being for lower class people.

Discussion: Changing Perceptions through Likeable Experiences?

The perception that older adults have of COTA being for lower class people got mentioned several times during the elderly interviews and professional interviews. Such
stigma turned out to be one of the main barriers preventing older adults from using and depending on COTA.

So as this problem revealed itself during the interviews, potential solutions and ideas were also suggested by older adults. All the approaches they’ve considered were about redefining COTA and creating more likeable experiences that alters the concept of transportation.

One suggested idea would be to have a television set on the bus displaying cartoon videos. The experience behind it is to make the trip feel shorter and at the same time create a friendly environment that will allow people to interact with each other and meet new friends.

The same idea was also suggested by another older adult; however, the experience is different. The older adult proposed that the television should broadcast news and public announcements. They want to stay alert and informed of everything happening around them and pass time.

Another suggested idea was having the bus driver tell historical stories at certain points of the journey. The experience behind it is for educational and entertainment purposes; one more way to help pass by the time.
The last suggested idea used to be one of COTA’s services, SCOT bus (Senior Citizen on Tour). Once a month, this bus would take a group of older adults on a fun trip at a very low fee. However, due to financial reasons, COTA had to dismiss this service. According to this older adult, the SCOT bus was a lot of fun and encouraged senior citizens to go out and interact.

All of the ideas and suggestions mentioned above had an entertainment element in them and the experience they wanted to get out of it was making the time during the bus trip seem shorter. Even though each older adult had different ideas about entertainment still they all were trying to gain the same experience. This leads to the following potential research question:

Is older adults’ change of perception influenced only by the type of entertainment being presented during a bus trip, by the general experience of time passing fast, or a combination of both?

Without elaborating any further, following are references to a few already existing designs that might help effect this research question:
1. Curitiba's Bus System (Goodman, Laube, & Schwenk).

The bus system in Curitiba, Brazil, is a successful bus system for time efficiency; the general experience that older adults mentioned earlier.

At Curitiba, they’ve created a transit system that makes the buses run more frequently and reach all destinations in minimal time possible. Their bus stop is a unique design, a glass tube that makes the boarding in and out of the bus much more efficient and secure. They integrated public transportation into all their urban planning system. With all these changes, they have managed to increase the number of ridership by 50 times and decrease the number of drivers by 28%.

2. Dublin Bus: Connecting journeys across the network (Dublin Bus).

The bus system in Dublin went through similar changes as Curitiba’s bus system plus they enhanced their graphic communication elements to better assist bus riders. Therefore their updated elements combined both the entertainment and general experience parts.
3. The EyeStop (Pescovitz).

The EyeStop is a conceptual bus stop designed by MIT researchers. Their approach is integrating pure entertainment elements. The design includes multi-touch screens that interacts with riders helping them plan for their trip, surf the web, monitor their real-time exposure to pollutants and use their mobile devices as an interface with the bus shelter.

Hence, as we have noticed, each one of the above designs approached the concept of changing perception differently. The first example, Curitiba’s bus system, focuses on the general experience which is making the trips happen at the shortest time possible. The second example, Dublin bus, is a combination of both entertainment and general experience. The third example, the EyeStop, contains pure entertainment elements.

However, this does not tell us which category is most successful nor has the most influence at changing people’s perception towards public bus transportation. Further research and studies are required to answer the research question.

This concludes that, like some other cities, and based on the reasonings we have reached in this thesis, COTA’s main concern should be changing older adults’ perception towards its system.
However, such change of perception is not just limited to older adults. Since we are working on a bus system that should be accessible to all, the universal design concept should still apply and COTA should work on maintaining the correct perception to all riders including older adults.

Mending the gap between older adults and COTA is beneficial to the growth of the public bus transportation in Columbus. At the same time, it provides older adults with a secondary or maybe even a primary mean of transportation that will help them stay active and involved in their community hence reducing the risk for social isolation. Such enhancements in their quality of life prolong their independent way of living and at the same time lengthen their stay in their own homes and community. That is the initial purpose of this thesis.
References


*Administration on Aging.* (2008, August). Retrieved 2010, from Department of Health and Human Services:


www.n4a.org/pdf/07-116-n4a-blueprint4actionwcovers.pdf


Bibliography

Universal Design


This study provides a real-world memory task that extends the ecological validity of previous research on aging and spatial memory. Elderly individuals were found to have less accurate verbal recall of urban landmarks and location memory for landmarks than younger adults. In addition to these quantitative differences in environmental cognition, qualitative aspects of the data were explored. In order to explain the poorer memory performance of elderly adults, participants' use of a geographically based, organizational mnemonic was examined. Furthermore, discriminant analysis revealed that the elderly relied more than younger adults on certain building attributes for memory of urban landmarks. These building attributes include: high public use, high symbolic significance, naturalness of surroundings, direct access to streets, and unique architectural style.

This book contains small articles covering several topics about emotional design and human centered experience. THIS BOOK IS EXCELLENT


How can urban designers develop an emotionally satisfying environment not only for today’s users but also for coming generations? Which devices can they use to elicit interesting and relevant urban experiences? This paper attempts to answer these questions by analyzing the design of Zuidas, a new city center emerging in the outskirts of Amsterdam.


This book is inspired by the unprecedented and growing worldwide interest in the design of environments and products that respect the diversity of human beings. Chapter 7: Designing by degree: assessing and incorporating individual accessibility needs.
THE CENTER FOR UNIVERSAL DESIGN is a national research, information, and technical assistance center that evaluates, develops, and promotes accessible and universal design in housing, buildings, outdoor and urban environments and related products. The Center's work manifests the belief that all new environments and products, to the greatest extent possible, should be usable by everyone regardless of their age, ability, or circumstance. Part of the College of Design at North Carolina State University (NCSU), Raleigh, NC, the Center promotes the concept of universal design in all design, construction, and manufacturing disciplines through research, design assistance, and training.

The Universal Design Alliance Inc. (UDA) is a non-profit corporation founded in March 2003. Their mission is to create awareness and expand the public’s knowledge of universal design, which is design for all ages, sizes, and abilities.


page 51 "I see in science one of the greatest creations of the human mind... It is a step at which our explanatory myths become open to conscious and consistent criticism and at which we are challenged to invent new myths." Karl R. Popper (Objective Knowledge) This book guides the researcher in conducting proper human centered studies. It also highlights the important elements and ways to focus on. A good source.

*Environmental Psychologie*


Human emotional responses to places are often intuitive and difficult to vocalize, but people only thrive in spaces that meet their emotional needs. The PlaceConcept methodology, which is firmly rooted in psychology’s phenomenological tradition, comprehensively elicits user (or potential user) emotion-based assessments of existing and proposed spaces.


Physically situated public art poses significant challenges for the design and realization of interactive, electronic sound works. Consideration of diverse audiences, environmental sensitivity, exhibition conditions, and logistics must
guide the artwork. They describe their work in this area, using a recently
installed public piece, Transition Soundings, as a case study that reveals a
specialized interface and open-ended approach to interactive music making.
This case study serves as a vehicle for examination of the real world challenges
posed by public art and its outcomes. This thesis is a sample, out of many, for
my future studies and evaluation. One can learn a lot from previous reviews,
surveys and analysis.

08, from http://www.socyberty.com/Sociology/The-Allure-of-the-
Metropolis.27834

According to this essay, the city is the mass collection of individuals from
different ethnic backgrounds, with different tastes and different beliefs. It is the
center of culture. The author discusses why some artists are attracted to working
and living in cities. He also argues that the four main benefits of urban living for
artists are: a strategic location for many encounters and hence inspiration; offers
anonymity and the possibility for recreation; and the place for modern life and
modern culture. He examines artists and art in the urban environment focusing
primarily on literary writers and musicians; through bits and pieces of historical
facts and recent studies. What’s important is his deduction which states that the
city is an attraction for artists simply because of its artistic expression.

US are cities that are known for exemplary urban planning programs over the past three decades. As such, they provide particularly useful illustrations of the intense development pressures that many urban areas currently face. This book explores the importance of the US urban governance; arguing that in general there has been unity between visionary leadership, innovative urban plans and effective citizen involvement. It states that urban design and architecture are the key to the success in making cities livable. However, such innovative urban planning and design projects first need to be governed effectively and adapted to the specifics of their local cultures and existing built environments. It shows how planning and urban policy can improve people’s lives in cities under the right political and social conditions.


Unlike all companies which are well explored and crowded with competitors, blue oceans represent untapped market space and the opportunity for highly profitable growth. Using dozens of examples from Southwest Airlines and the Cirque du Soleil to Curves and Starbucks, they urge companies to value innovation to create and capture new demand and to focus on the big picture,
not the numbers. Their use of figures such as the strategy canvas and the Eliminate-Reduce-Raise-Create grid provide simple tools to help the reader understand the concepts presented. What is so important to me in this book is how to focus on the big picture, not the numbers. Consider the competitive environment through people's eyes so that to stay focused on what matters to them. Even if innovation is the big boom still it must be made relevant to customers and provide value.


The document mentions and explains several aspects concerning environmental psychology; concepts, influence and applied environmental psychology in a social structure. Concept relates to a type of study or research that is best conducted when studying a certain environment; mapping. The influence section mentions that the characteristic personality make-up of persons in a country is shaped by the nature and type of environment to which they are subjected for long periods of time. As for the applied environmental psychology, it aims at better management of the environment for better life and psychological growth. It studies effective ways of conserving the natural environment, better ways of designing towns and cities and means of promoting environmental awareness among people. Although it’s brief, this site is a good
start up source and reading before conducting and evaluating any research studies.


Manfredi's book is a self-reflective evaluation of art and its originality; the change in its definition, usage, purpose and function during several centuries. In his own way, he tries defining the origin of originality from an environmental, social and religious point of view and how it affected people's perception of art and beauty. The second part of his book talks of the anniolation of originality: learning to unlearn. How can people disregard all standardized copies called art; being in harmony with ourselves not complying with the rules and regulations of the society's status? Although too philosophical, this book gave me a better understanding of art and originality; thinking out of the box hence out of the realm of society. Sometimes the best way to find the suitable solution, one should look at the problem in an objective global point of view; this does not disregard people and society's notion and feeling towards the solution. After all, they are the final consumers and judges.


The site is a human study conducted on a random sample of people who uses the metro. Through videos and some surveys, they were able to collect their data for evaluation. This analysis is a good sample for my study and research element on society.

Navigation


Gerontology is the study of the social, psychological and biological aspects of aging. It is distinguished from geriatrics, which is the branch of medicine that studies the disease of the elderly. The book is extremely academic and not meant for Designers. However, they do target several psychological problems concerning elderly people due to changing or unadaptive social realm which helps Designers to have a better perception and understanding of their target audience. (People's perception of their own health changes according to the place, time and conditions of the situation. A growing body of evidence shows that older people perceive themselves as healthy even in the face of real physical problems. This suggests that with aging, people adapt to change in their objective health and functional performance and tend to assess their health as the same, or even better, with increasing age despite an increase in chronic
diseases and decline in functional performance... For the individual, healthy aging means having a sense of well-being, the capacity for independent activity, meaningful involvement, supportive environments and positive attitudes. Being healthy is seen as having the resources for an everyday life that is satisfying to self and others... PAGE 147


It is a curtain wall that covers the front of an entertainment complex in Beijing. It features the world’s largest color LED display, powered by a photovoltaic system integrated into the glass curtain wall. It is a smart way for using "green" and sustainability. This Media Wall showcases a selection of specially commissioned video installations and live performances by artists from China, Europe and the US.


This book is a perfect example of the proper process and guidelines required in an urban environment to better accommodate elderly people with dementia. The studies conducted in this book are set for European countries; UK in particular, which gives priority to pedestrians instead of vehicles. Explanations and examples that are mentioned are well articulated and useful as a head start for
my thesis direction. (The most important factor here is not just that older people prefer traditional designs because of their familiarity or aesthetic appeal but also that older people often cannot identify what the modern types are and avoid using them because they fear that they might now understand how to use them..page 7...Distinctiveness relates to the extent to which streets give a clear image of where they are, what their uses are and where they lead. Distinctive streets reflect the local character of the area and have a variety of uses, built form, features, colors and materials that give the streets and buildings their own identity within the overall character of the neighborhood... page 151... page 162).


This article is about a tiny extension house on Long Island with a grand mission: to lengthen the life of humans through jarring aesthetics that engages the body and in turn facilitates the stimulation of the immune system. The Bioscleave House is based on a novel concept; one that takes an inverted look at sustainable living by focusing first on the immediate environment which we inhabit, and thereby sharpening our attitude toward the world at large. The building looks like children playing house; with crayola colors and simple geometric forms and shapes, from inside and out. The notion and perception
behind the project is helpful to the environmental psychology element of my thesis. In this article in particular, they conduct a small research and questionnaire about the building. It shows that people perceive relaxation and practicality differently; especially in the interior of the house. Therefore a more realistic approach is being suggested.


This book is a summary of what way-finding is, where it came from, who needs it, and how projects unfold. Also it shows real examples of implemented way-finding projects along with general Design guidelines of what to consider when designing such elements.


I’DGO is a research association consisting of a core group of academic researchers who, together with a wide range of partners, constitute a virtual center of excellence focusing on design of outdoor environments to include older people and disabled people.

This book examines constructions, representations, imaginations and theorizations of urban space and cityscapes in modern and contemporary culture. The author examines in particular the aesthetic, narrative, and representational strategies used to interpret the dynamic space of cities. Also he explore the relationship between urban space and a variety of pressing cultural concerns, including issues of identity, memory, technology, class, gender, nation, and ethnicity. This book makes sense concerning urban spaces and how people tend to fit in or belong to their surroundings and society; what questions to ask and matters to take into consideration.


This guidebook is for architects and designers unfamiliar with the uses of color as a decorative element for the outside of buildings. It divides each color palette on its own, along with its tones and values, explaining the best combination of colors, their visual meaning and where is it best placed and used. This book is a good example for understanding the meaning of colors when placed in their urban surroundings. Even if it is an old book, and conditions might have
changed, it could always be a good source for ideas and a tool of comparison with the new settings.


The building is an image of the content; made of shiny white letters in a red sky light. The building is dedicated to branded fashion whose names are represented on the exterior facade. This article is the beginning of a new building design; where they used layers of light on the entire exterior facade to create a 3D visual effect and reflection of what is inside; a building with graphical design concept.

*The Demon-Haunted World.* (n.d.).

This link is a presentation of the interesting ideas that are being developed by mixing digital softwares with cities; "making the invisible visible".


United Nation's present statistical population division and future postulations.
There are now Certified Aging-in-Place Specialist (CAPS) specialists to fill the growing need in this service model for seniors. Communities are now fully engaged and committed to exploring ways to better serve seniors by developing action plans that address the future needs and ensure that the services are in place for seniors. According to the United States Census, there will be a spike in the age 60+ population from 43,873,000 in 2005 to 73,769,000 in 2020, an absolute increase of 68 percent.


This site contains governmental recent amendments and insights towards the Americans with Disability Acts. Up-to-date and comprehensive source of research and analysis related to the enforcement of the Americans with Disabilities Act. Also, new law which clarifies and broadens the definition of disability, and expands the population eligible for protection.

It was extremely hard for me to read and understand this book. It is a set of researches and experimentations conducted on visually impaired people for several reasons or expected outcomes; the physically and sensory levels of perception and action. Even though this is not too related to any topic I might choose, however, it is a good source and example for several types and samples of research and experimentation methodologies.


This is just a preliminary website which mentions and explains several types and branches of disability along with their definition. I am working on sensory impairment.

*Disability Services in New Zealand*. (n.d.).

This site gives a short bibliography of Patricia Moore. She is very well known for her unique method of experimentation for elderly. Dressing up as an old lady and conducting her research.
Marek, B. (n.d.). *Before a blind child can read a map.*

Tactile graphics is a notoriously difficult area in the education of congenitally blind children, and yet, since so much information vital for the correct functioning in this, predominantly sighted world, is available as two-dimensional visual displays, tackling the problem of making this information accessible to blind people becomes an urgent task. The aim of this paper is to show how tactile graphics can be incorporated into teaching programmes for different subjects and into leisure activities, and how a structured course in production and recognition of tactile drawings can be made more effective and more enjoyable by making use of some high and low tech devices, as well as with the help of some do-it-yourself tools.

Ohio Disability Data Table From the 2004 American Community Survey. (04). *CPAS.*


This website is a survey conducted in 2004 as a comparison between the entire population and its disability and self-care members.

This site is a more recent set of datas and surveys conducted for the following:
The Types of Households in Ohio; Geographic Mobility of Residents of Ohio;
The Educational Attainment of People in Ohio; Employment by Industry in Ohio; Poverty Rates in Ohio; The Age Distribution of People in Ohio; The Types of Housing Units in Ohio; Occupants with a Housing Cost Burden in Ohio.


The book is for teachers and people who work with blind and visually impaired people. It gives advices on ways and means to best assess, vocationally and socially, handicapped people to best help them physically and psychologically mingle and belong to the society. This source helps me in understanding the basic needs and information that should be delivered or given to visually impaired people in order for them to be independent and self-sufficient.
There are now Certified Aging-in-Place Specialist (CAPS) specialists to fill the growing need in this service model for seniors.[4] Communities are now fully engaged and committed to exploring ways to better serve seniors by developing action plans that address the future needs and ensure that the services are in place for seniors. According to the United States Census, there will be a spike in the age 60+ population from 43,873,000 in 2005 to 73,769,000 in 2020, an absolute increase of 68 percent.


During recent years, an increasing amount of academic research has focused on older people with a particular emphasis on settings, places, and spaces. This book provides a comprehensive review of research and the policy area of ageing and place. It provides a valuable information and reference source for those with interests in the spatial dimensions to ageing in the twenty-first century. Ranging from macro-scale perspectives on the distribution of older populations on national scales, to the meaning of specific local places and settings to older individuals on the micro-scale, the book spans an entire range of research tradition and international perspectives.

This book talks about designs for people with Alzheimer. Although it is not my target audience, but understanding these people needs might give me some ideas on how to solve some of the issues for older adults.


Very Interesting! This book unfolds harmful myths about aging and illuminates the biological and emotional foundations of creativity in older adults. The book contains interviews, scientific research and true stories.


A well in depth book that redefines and provides a new conception to retirement and old age.


This article reviews the empirical literature published over the last 20 years on the effectiveness of interventions that target social isolation amongst older people. The results reveal that although numerous such interventions have been implemented worldwide, there is very little evidence to show that they work.


The goal of this chapter was to reinforce the importance of independent mobility to the health and well-being of older adults, discuss how technology can be used to foster safe mobility and independence, and present some general guidelines for the design of technologies used within the context of transportation systems.


This paper is a project designed to make others aware of the issues surrounding changing vision in the elderly. Information for this project was drawn from personal experience, interviews, and literary research of recent journal articles and on-line resources.

This site is a more recent set of data and surveys conducted for the following:
The Types of Households in Ohio; Geographic Mobility of Residents of Ohio;
The Educational Attainment of People in Ohio; Employment by Industry in Ohio; Poverty Rates in Ohio; The Age Distribution of People in Ohio; The Types of Housing Units in Ohio; Occupants with a Housing Cost Burden in Ohio.


"It has been widely said that whatever many may say about the future, it is ours-not only that it may happen to us, but it is in part made by us" Dr. Ethel Percy Andrus, Social Activist, 1884-1967. EXCELLENT BOOK


The Kannon project team at the National Chiao Tung University (NCTU) in Taiwan is developing a ubiquitous service infrastructure for elders’ healthcare
support. Among their deliverables, there is a PDA Phone, christened Health Pal, which can communicate with Bluetooth/ZigBee devices, universal plug-and-play (UPnP) e-home service platforms, and online healthcare providers to offer 24/7 healthcare services to elderly people. This paper presents the early results of this effort including the functional and operational concepts of Health Pal as well as the activity-oriented approach of its design. Preliminary results of its usefulness and usability evaluations are reported. A comparison of this platform against several similar prototypes was also included to illustrate the advantage of applying activity-oriented design approach to human-computer interactions.

Transportation


Bus Stop Design Guidelines (Tech.). (n.d.).

This work was developed by and for OMNITRANS, a joint powers authority governed by a 20-member Board of Directors representing the County of San Bernardino and the 15 cities OMNITRANS serves. The purpose of these guidelines is to develop suggested design criteria that should be considered when designing and placing transit facilities. This information is not to be used as a set of standard details on which to base a final design, but rather as
recommended criteria and general guidance for the placement and safe design of transit facilities.


Public transportation systems are among the most ubiquitous and complex large-scale systems found in modern society. For those unable to drive such as people with cognitive disabilities, these systems are essential gateways for participation in community activities, socialization, and independence. To understand the magnitude and scope of this national problem, we highlight deficiencies identified in an international study by the Transportation Research Board of the National Research Council and present specific cognitive barriers identified in empirical studies of transportation systems in several U.S. cities.


This article is about a study conducted in Rome on people between the age 18 and 84. The purpose of the study was to analyze what and how all generations felt when using public transportation.

This review discusses how urban form affects public health, specifically through the ways in which the built environment encourages or discourages physical activity levels.


This paper considers how mobile devices, such as handheld computers, can provide support older people in mobile or stationary situations. It examines a particular example, navigation, showing that older people can benefit from the use of mobile devices and highlighting the need to learn more about how to design them for this user population.
Based on extensive research, the easy-to-use system presents information in a range of ways, including on maps and signs, to help people find their way. It's also integrated with other transport modes so when people are leaving the Underground, for example, they can quickly identify the route to their destination.


Smith, R. E. (n.d.). *Design Considerations* (Tech.).

Functional Criteria to Consider When Designing a Bus Stop

SolarOne Light’s up a Winning Design in Montreal’s Bus Shelter Design Competition. 


CEO’s for Cities is a civic lab of today's urban leaders catalyzing a movement to advance the next generation of great American cities.


The understanding of way-finding and people's functional mind for orientation.


This study could be applied to analyze older people's choices after being moved to institutions and housings.


This is the professional blog of public transit planning consultant.
Appendix A: Sample of Questionnaire

Research Study on COTA bus stops:

Name: __________________________________________

Contact info:
______________________________________________________________________
______________________________________________________________________

- Age: _____ Gender: _____ Marital Status: __________

- Living Conditions:

  ___ Alone   ___ With Spouse   ___ Else, Please specify: ________

- My primary transportation system is:

  ___ Car   ___ Public Transportation   ___ Other, Please specify: ________

- My secondary transportation system is:

  ___ Car   ___ Public Transportation   ___ Other, Please specify: ________

- Most of my trips are:

  ___ Alone   ___ With Spouse   ___ Other, Please specify: _____________
- How do I plan for my trip?

- Do I look for support most of the times I go out?  
  ___ Yes  ___ No
  
  - **If yes**, what type of support do they provide?

- How comfortable am I with my directional skills? (N/S/E/W, landmarks…)

- If I were traveling in an unfamiliar neighborhood, how would I find where I needed to go?

- If I were to need help, do I feel comfortable asking for it?  
  ___ Yes ___ No
- Do I consider myself a way-finder (find my own way to a specific destination) or a way-follower (follow directions for a specific destination)?

______________________________________________________________________
______________________________________________________________________
______________________________________________________________________

Public transportation:
- Do I consider public transportation as a daily life necessity?  ___ Yes  ___ No
- If it had all the proper accommodations, would I rely on public transportation as my daily commute?
  ___ Yes, Why?
  ___ No, Why?

- Have I ever ridden the COTA bus before?  ___ Yes  ___ No

  - If Yes, how many times so far?
    ___ Less than 5 times  ___ Several times  ___ Stopped counting
  - If No, what are the reasons for not using the bus before? Check all that apply.
    ___ Didn’t know how  ___ Fear of getting lost  ___ Forgetting route
- Why didn’t you use the bus system?

- Didn’t feel able
- Being stranded
- Falling
- Being injured
- Inconvenient
- Other transportation
- Am able to drive
- No money
- Not near a bus stop
- Other reasons:

- What do I expect to find on or near a bus stop that will help me use its services?

- What type of information would I like to find on a bus stop?

- What would I change about COTA’s bus stops? Please mention why.

Please evaluate the function of the following bus stop elements either:

Good – Fair – Poor

- Sign visibility
- Shelter safety
- Bench accessibility
- Map content info.
- Time schedule
- Lighting at night

157
- I’d like to mention a few things about bus stops:

____ Weather compatibility

Thank You
Appendix B: Sample Cards from Elderly Interview