User centered design evaluation of the grocery store environment:

Shelley A. Steenblock

Iowa State University

Follow this and additional works at: https://lib.dr.iastate.edu/etd

Recommended Citation
https://lib.dr.iastate.edu/etd/11345
User centered design evaluation of the grocery store environment:
A study based on an aging population’s perception of the person-environment fit

By
Shelley Steenblock

A thesis submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of

MASTER OF ARTS

Major: Art and Design (Interior Design)

Program of Study Committee:
Lori Brunner, Major Professor
Amy Mikovec
Peter Martin

Iowa State University
Ames, Iowa
2010

Copyright © Shelley Steenblock, 2010. All rights reserved.
Table of Contents

List of figures .........................................................................................................................viii
Acknowledgements ....................................................................................................................xi
Abstract ........................................................................................................................................xii

I. Chapter One: Introduction ........................................................................................................1
   A. Successful aging .....................................................................................................................1
   B. Background ..........................................................................................................................2
   C. Demographics ......................................................................................................................4
      1. Older adults .......................................................................................................................4
      2. Statistics ............................................................................................................................5
      3. General influences ..........................................................................................................7
      4. Baby Boomers ..................................................................................................................8
   D. Retail incentive ....................................................................................................................9
   E. Problem identification .........................................................................................................11
   F. Significance of the study .......................................................................................................12
   G. Objectives ...........................................................................................................................13
   H. Research questions .............................................................................................................15
   I. Limitations ..........................................................................................................................16
   J. Assumptions .........................................................................................................................17
   K. Thesis organization ............................................................................................................17

II. Chapter Two: Review of the literature ..................................................................................19
A. Research base for this study ................................................................. 19

B. Theories .................................................................................................. 22

1. Environmental gerontology ........................................................................ 23

2. Congruence model .................................................................................. 24

3. Psychological influences ........................................................................... 26

C. Lifestyle trends .......................................................................................... 27

1. Aging in place .......................................................................................... 28

2. Boomer expectations ................................................................................ 29

D. Normal age changes .................................................................................. 30

1. Physical changes ....................................................................................... 30

2. Environmental adaptations to consider with age ........................................ 32

E. History of the development of the grocery store ......................................... 35

1. What is shopping? ...................................................................................... 35

2. Grocery stores .......................................................................................... 36

3. Turn of the century .................................................................................... 37

4. Suburbia .................................................................................................... 38

5. Discount store evolves ............................................................................ 38

6. Big Box ..................................................................................................... 39

F. Humanistic design ..................................................................................... 41

1. Design phases ............................................................................................ 41

G. Previous research ..................................................................................... 42

1. Design features .......................................................................................... 42
2. What we have learned ........................................................................................................... 45

III. Chapter Three: Methods ......................................................................................................... 46

A. Previous research: development of measurement tools ......................................................... 46
B. Study participants .................................................................................................................. 48
C. Instruments ........................................................................................................................... 49
D. Research procedures ............................................................................................................. 53
E. Data analysis ........................................................................................................................ 56
F. Limits of the study ................................................................................................................ 57
G. Validity and reliability .......................................................................................................... 58

IV. Chapter Four: Data results and discussion ............................................................................. 62

A. Opening question responses ............................................................................................... 63
B. Introductory question responses .......................................................................................... 63
C. Transition question responses ............................................................................................. 64
D. Key question responses ........................................................................................................ 64
  1. Entrances and exits: Shared comments .............................................................................. 64
  2. Entrances and exits: Special issues/perceptions ................................................................. 65
  3. Access points from the parking lot to the store: Shared comments ................................. 66
  4. Access points from the parking lot to the store: Special issues/perceptions ................. 67
  5. Carts: Shared comments .................................................................................................... 68
  6. Carts: Special issues/perceptions ....................................................................................... 69
  7. Aisles: Shared comments .................................................................................................. 70
30. Checkout: Special issues/perceptions ................................................................. 94
31. Overall preferences .......................................................................................... 95
32. Sensory interpretation ....................................................................................... 95
33. Miscellaneous .................................................................................................. 97
34. Technology ...................................................................................................... 98

E. Discussion ......................................................................................................... 106

V. Chapter Five: Pulling it all together ................................................................ 109

A. Summary ............................................................................................................ 109
B. Discussion: answering the research questions .................................................... 116
C. Recommendations for the future ....................................................................... 120
D. Conclusion ......................................................................................................... 121

E. Table 1: Primary concerns of elderly shoppers .................................................. 123
F. Table 2: Primary preferences of elderly shoppers ............................................... 124
G. Table 3. New design feature ideas of elderly people ......................................... 125

Appendix A: IRB submittals ................................................................................... 126

A. Letter of approval............................................................................................... 126
B. Application for approval of research .................................................................. 127
C. Research participant form ................................................................................ 137
D. Focus group invitation ...................................................................................... 138
E. Participant consent form .................................................................................... 139
F. Process for conducting research and focus group discussion script .................... 144

Appendix B: Definitions ......................................................................................... 151
Appendix C: Referenced photographic image sources ................................................................. 153

Referenced sources .................................................................................................................. 162
List of figures

Figure 1. Diagrammatic representation of Lawton and Nahemow’s 1973) Environmental Press Model super imposed with the Congruency Model. ............................. 25

Figure 2. Diagrammatic representation of the realm for design intervention using the person-environment theories. .......................................................... 35

Figure 3. Photographic images of shopping cart examples .......................................................... 69

Figure 4. Photographic illustration of a traditional grocery store schematic floor plan. .......................................................... 71

Figure 5. Photographic illustration of a typical modernized grocery store schematic floor plan. .......................................................... 71

Figure 6. Photographic illustration of a revised grocery store schematic floor plan. .......................................................... 72

Figure 7. Diagrammatic view of traditional aisle layouts .......................................................... 73

Figure 8. Diagrammatic view of revised modern aisles .......................................................... 74

Figure 9. Photographic illustration of a sturdy bench with open area below. .......................................................... 75

Figure 10. Photographic illustration of portable lift assistance devices for seating. .......................................................... 75

Figure 11. Photographic illustration of flooring systems: Rubber mats and in-floor airflow system detail. .......................................................... 76

Figure 12. Floorometry™ non-slip flooring system .......................................................... 77

Figure 13. Photographic illustration of under shelf lighting and LED rope .......................................................... 79

Figure 14. Photographic illustrations of graduated shelving .......................................................... 79
Figure 15. Photographic illustration of dry goods bins ................................................................. 80

Figure 16. Photographic illustration of shelving item price labels ..................................................... 80

Figure 17. Photographic illustration of the light spectrum and examples of colored font on different colored backgrounds. ........................................................................................................................................ 82

Figure 18. Photographic illustration of examples of information computer kiosk. .......................................................... 84

Figure 19. Photographic illustration of freezer displays options ............................................................ 86

Figure 20. Photographic illustration of a fresh meat display case ............................................................ 87

Figure 21. Photographic illustration of a standard floral displays ....................................................................................................................... 89

Figure 22. Photographic illustration of an example of a dietary consult kiosk and a demonstration/test kitchen. ........................................................................................................................................ 91

Figure 23. Diagrammatic sketch of a standard checkout station ................................................................................ 94

Figure 24. Photographic illustration of examples of troffer lighting, louvered lighting and direct-indirect lighting. ........................................................................................................................................ 96

Figure 25. Photographic illustrations of the “Giving Cart”™ by Klever Marketing. ................................................................. 99

Figure 26. Photographic illustration of the charging station for the “Giving Cart”™ by Klever Marketing. ........................................................................................................................................ 100

Figure 27. Photographic illustration of the “Scan It”™ pricing gun ................................................................................ 100

Figure 28. Photographic illustration of the “Concierge”™ shopping cart ................................................................................ 101

Figure 29. Photographic illustration of a phone information receiver ................................................................................ 102
Figure 30. Photographic illustration of an example of digital map schematic ........................................... 103

Figure 31. Photographic illustration of the PowerPad™ charger ........................................................................ 104

Figure 32. Photographic illustration of a rotisserie appliance ........................................................................... 105

Figure 33. Photographic illustration of pull down shelving ............................................................................... 105

Figure 34. Photographic illustration of the Diago™ mechanized wall .................................................................. 105
cabinet lift.

Figure 35. Photographic illustration of the “Diago”™ mechanized wall diagram .................................................. 106
cabinet lift diagram.

Figure 36. Entrance A: Entrance and exit all in one place .................................................................................. 109

Figure 37. Entrance B: Designated entrance and exit immediately next to one another .................................... 110

Figure 38. Entrance C: Designated entrance and exit near one another but set apart ......................................... 110

Figure 39. Photographic illustration of a typical public restroom layout .............................................................. 113

Figure 40. Photographic illustration of an updated accessible public restroom ....................................................... 114

Figure 41. Airport style restroom layout with an open entrance ........................................................................ 115

Figure 42. Diagrammatic adaptation of the family style restroom layout using automated door entrances/exits. .................................................. 116
Acknowledgments

I would like to express my sincere appreciation for the help and guidance I received from several of my Professors, Lori Brunner, Christine Cook, Peter Martin, Amy Mikovec and Mary Yearns. I learned a great deal from each of you prior to beginning this research journey as well as along the way. Without your continued support I could not have completed this project.

I would also like to express thanks to the participant retirement communities that voluntarily allowed me to meet and talk with their residents to further my education. I enjoyed meeting and talking with every volunteer participant. It was truly a wonderful experience and without their contribution of time I could not have completed this study.

As a result of the very first focus group I conducted, a resident participant wrote a poem to share with me. I include it here as a reminder of the largely shared enthusiasm I encountered in the discussions. It inspired me to continue my quest for learning and attempt to improve the future.

A shopping I will go
With my list in hand
I’m ready for the show
Strike up the band.

Get this cart moving
Through this narrow aisle
Gotta find the shelving
That holds my morning dial.

Toss me a carrot
One apple too
The cookies look great
And I’ll take two.

Now to the checkout lane
It’s always full and slow
It’s really quite a pain
But thus through life we go.

Study participant, identity protected
Abstract

This study identifies challenges experienced by older adults within the grocery retail environment. Evaluation of design features is based on user input to identify areas that work well versus those that could benefit from replacement, enhancement or redesign. The objective is to promote greater independence in the task of grocery shopping. Results from this study are of interest to design professionals, retail grocery store management and developers regarding the changing needs and preferences of the aging population segment in the grocery store setting.

Data collection for this study is based on a series of focus group meetings at four different locations. Participants were older community members who live independently, cook for themselves and grocery shop at least twice a week.
Chapter One: Introduction

Successful aging

Environmental context and aging have come to play important roles in design theory and gerontological theory that strive to optimize the relationship between an aging population and their surroundings. According to a national survey, Fixing to Stay, conducted by AARP (Bayer and Harper, 2000) as Americans grow older they want to remain living in single family dwellings, and many actually modify their residences to enable them to do so. More than 8 in 10 respondents age 45+ and more than 9 in 10 of those 65+ say they would like to stay where they are for as long as possible. Even if they should need help caring for themselves, 82% would prefer not to move from their current homes. This fact requires designers to reconsider the design of public spaces routinely inhabited by an aging population.

There are both physical and psychological changes experienced by all people as they age regardless of cultural influences, race or gender. These changes usually become evident gradually over time and impose limits in varying degrees. While routinely performing instrumental activities of daily living, challenges can be experienced in movement, coordination, balance, muscle strength and with all five senses. Accepting these limits as part of the life cycle will support successful aging by remaining cognitively sharp, physically active, actively engaging in the community and maintaining a social network (Kopec, 2006; Rowe and Kahn, 1998). Some studies have actually suggested that continuing to live
independently, continuing to be self-sufficient in diet and exercise can actually reverse some of the normal physical declines of aging (Rowe and Kahn, 1998). Recognition of these challenges affects a person’s sense of self and can present disturbances in confidence with regards to activities of daily living, maintaining a social network and making educated choices and self-esteem. Research has shown that remaining physically and mentally active promotes optimal personal performance through balancing environmental press and personal competence (Lawton, 1986; Shephard, 1998). This balance, then, slows the rate of decline with age and enhances the likelihood of maintaining independence (Aldwin, Spiro and Park, 2006). In comparison with past generations, the current 65+ population is healthier and more active (Cassel, 2002; Crews, 2003). When people perceive a sense of support for autonomy they generally experience a greater sense of well being and overall life satisfaction (Kopec, 2006).

**Background**

Designing physical environments in a manner that supports declining functional abilities can enable successful functional adaptation for optimal independent performance (Pynoos, Nishita and Perelman, 2003). These facts make it clear that public spaces frequently visited by this aging population should be reconsidered for ease of use and recognition of physical challenges routinely experienced by an aging population as a result of design feature barriers. In 1951, social psychologist, Kurt Lewin developed a theory that the way a person behaves in a space, or makes optimal use of a space, is a function of an individual interacting with the environment.
Lewin’s formula: Behavior is a function of the person and the environment

The grocery store environment is an important space for everyone but little research has been done to understand the relationship between the aging condition (functional limits) and the design feature challenges that exist within this environment. As will be discussed later in this paper, theories of person-environment fit were studied in the 1980s and focused generally on the relationship of a person with the residential environment or local community and attempted to measure the degree to which these environments support the ability to successfully complete activities of daily living. In addition, the research regarding the relationship between aging and the environment has largely been conceptual in that knowledge gained from gerontological studies has not routinely been incorporated into design theory and practice (Kopec, 2006; Wahl and Weisman, 2003). While accessibility guidelines have been incorporated into building codes since 1990, they are usually only minimally implemented and universal design practices remain a special area of study in design practice (Wahl and Weisman, 2003).

This study concerns itself with how an environment can fit the needs of the aging user and is developed based upon the body of research conducted by Caroline Hare, a marketing professor at the University of Stirling in the United Kingdom. She spent years measuring levels of satisfaction of the food shopping environment and self-reported experiences of elder individuals based on various aspects, of which one includes the internal store environment. The depth of her exploration in this area has included general store facilities,
design layout and accessibility. This study recognizes many of the same challenges but is an effort to further research by exploring participant-based alternative design features solutions to identified challenges. Methods employed in her body of work have included case studies, surveys and focus groups. Methods employed in this study include observation and focus group discussions.

Demographics

**Older adults**

So why study older adults? Some might believe that studying older adults for the purpose of future design doesn’t make sense and is a waste of time because there exists an assumption that an elder population is set in their ways and don’t like change. By studying older adults, design professionals can learn significantly more about younger populations for purposes of the present and the future.

While considering the enormity of influence this group has based on their numbers, keep in mind that while they are not a homogenous group, they do have similarities amongst them as well as similarities with younger populations and those who endure physical challenges at any age.

Best design practices can be developed based on scientific knowledge of the three dimensions of aging (biological, psychological and social) and by paying attention to the components of successful aging (avoiding disease, staying active both mentally and physically and establish/maintain social networks). These issues are central to the study of aging but essentially apply to all people (Fisk, Rogers, Charbness, Czaja and Sharit., 2009;
Lawton, 1986). Through designing public spaces for this population the design professional can also consider younger populations’ dynamic needs and preferences. Environmental design considerations for an aging population become a quality of life challenge and it is in this realm of consideration that universal design, disability practices and technology are recognized (Fisk et al., 2009). Understanding human behaviors, characteristics, capabilities and limits relevant to design strategies for an aging population can also support the design of spaces for younger populations and help make informed predictions for the future.

Statistics

It is no secret that the worldwide population is aging. It is estimated that by the year 2030, 25-30% of the population in the United States will range between the ages of 61 and 79, an estimated 78 million people (U. S. Census Bureau, 2000). By the year 2050 it is predicted that there will be 80 million people over the age of 64; the oldest portion of this group (85+) is predicted to be the fastest growing population segment, comprising an estimated 19 million by 2050 (Bunker-Hellmich, 2007). According to the U. S. Government Census Bureau, 2008 national estimates revealed that the 65+ population was about 13% or just slightly less than 39 million people, representing an eleven-fold increase since the turn of the century (Bemben, 2002). Of these, 88% live independently.

The U. S. Bureau of Labor Statistics reports that moving into the new millennium, globally, the economy now heavily relies upon the service industry and employment opportunities are in high demand. While the current economy has recently experienced severe job losses and the current unemployment rate is hovering around 9.9%, there exists a job need of at least 22 million positions with an estimate of 17 million available workers.
The U. S. Government projects an increase of 0.8% annual growth rate for employment in the 16 to 54 age group compared to 1.1% for the previous decade (Lacey and Wright, 2009). The growth rate for jobs in the grocery store industry is now about 2% but is expected to increase to 13% by 2018 (Lacey and Wright, 2009). The anticipated growth for all industries in the United States is approximately 14% (U. S. Bureau of Labor Statistics, 2009). Current estimates for the 18 to 64 age range is approximately 164 million people or approximately 63% of the national population. While not all of these individuals are employed, the ratio of working individuals to those retired (referred to as the dependency ratio) is currently estimated to be about 3.4 to 1. Projected estimates of this ratio by 2050 are 2:1 (Moody, 2010). As evidenced by these statistics, the employed generations that follow the current 65+ population are fewer in number and projections suggest that there will be a great need for employment positions within the grocery store industry that may not be easy to fill. Neal Learner, a professor at Massachusetts Institute of Technology (MIT) and a reporter for the Christian Science Monitor (www.workpermit.com), explained future projections by the following:

"You buy groceries at your friendly local food store and you have come to depend on the person behind the fish counter. You show up one day to buy your fish, and that person is no longer there because he's changed jobs. The person who is there doesn't seem to know what he or she is doing, and furthermore, doesn't really care much about you. And you're not the only one who feels this way. Other customers feel the same deterioration in service, and they choose not to go there anymore. Now that store is in trouble. Because it cannot find good people to serve its customers, its sales drop. You go back again and this time there is nobody behind the counter, and you have to call for somebody to help you."

Statistics reveal reasons for a shrinking labor force to be fewer babies having been born resulting in fewer persons actively employed, an aging population that is living longer and
geographic separation of workers and jobs (www.workpermit.com). As we all begin to feel the effects of the decline in the available work force, relying upon employee help within the grocery setting may not be as easy as it is today.

The state in which this study took place has an estimated (2009) population of just over three million people of which nearly 15% (450,000) are over the age of 65 (quickfacts.census.gov). The county's estimated (2009) population is slightly over 87 thousand of which just over 10% (9000) are over the age of 65 (quickfacts.census.gov). The particular city within which this study took place has an estimated population just over 56 thousand people of which just over 14% (8000) are over the age of 65 (www.census.gov).

**Generational influences**

American society recognizes the life course theory through labeling blocks of years for any given population segment such as: young adult, adult, middle-aged adults, older adults, retired adults and very old adults. While difficult, accepting these labels requires acknowledgment and realization of our advancing age in physical, psychological and social areas (Coburn and Treeger, 1997).

Society tends to group together ranges of ages and refer to these groups as generations. In an effort to further define these groups, characteristics that appear to be shared by many or most within these ranges are noted and help to make comparisons between age groups. Though not required, American society tends to acknowledge 65 as the assumed retirement age. Thereby commonly referring to anyone 65+ as elderly; tending to lumped together the children of the Great Depression (born prior to 1915), the World War II children (born between 1915 and 1930) and the Silent generation (born between 1930 and 1945).
individuals’ values were shaped by shortages and limitations and are currently referred to as the Builders (Gaylor, 2002; Lancaster and Stillman, 2002; Zemke, Raines and Filipczak, 2000). Throughout their lifetimes, the Builders have had to take charge and build homes, schools, businesses, civic institutions and organizations. Their life philosophies include: saving money for the future, careers are a means for living and a desire to live without the need for technology, which is perceived as intimidating. Many of them are overwhelmed by the rapidly changing world around them and do not particularly see a need for change: they prefer to rely on what they know works. Builders tend to be very grateful for what they have and value conformity, order, patience, thriftiness, consistency, sacrifice of personal luxury and delayed rewards (Gaylor, 2002; Lancaster and Stillman, 2002; Zemke et al., 2000).

**Baby Boomers**

The first of the Boomer generation will turn 65 in 2011. According to Ken Dychwald’s (1999) book, Age Power, the 78 million people born between 1946 and 1964 have transformed every phase of society and the way people live. Dychwald points out as a group, Boomers, unlike their parents, have rebelled against the status quo, questioning everything in a desire to make their existence better. For this generation, abundance and choice rule, and being informed regarding these multiple choices has been a key driving force in their exhibited behaviors. Boomers are far less likely to sacrifice for the greater good of a community than their parents and are frequently referred to as the “me” generation (Dychwald, 1999; Gaylor, 2002; Lancaster and Stillman, 2002; Zemke, Raines and Filipczak, 2000). Marketing quickly learned about these characteristics and the life
philosophies of “buy now pay later” and “you deserve it,” were born. Wolfe and Snyder (2003) point out that Boomers love acquisition of “toys”; pleasure, comforts and amenities seem to be the point of life. They suggest that this generation does not believe they have to grow old; they in fact seem to do what they can to prevent it. And they expect caring environments (Gaylor, 2002; Lancaster and Stillman, 2002; Zemke et al., 2000). Dychwald (1999) also notes that this particular group controls the majority of the nation’s wealth and due largely to their vast numbers, is a significant political influence. Dychwald summarizes this population segment as having dominated American culture for 50 years. Any and all issues that involve or interest them have become dominant social, political and economic themes for American society.

Understanding this generational information is important because it conveys significant differences between generational preferences, expectations and attitudes. These, in turn, influence the way in which structural design and interior design feature changes are considered necessary as amenities or expected as people age.

Retail incentives

Goodwin and McElwee’s research (1999) suggests retail grocery store management should be interested in these study results because they indicate needs, preferences and expectations of a rapidly growing segment of the consumer market. These results reveal promising areas of focus for investing in change within the grocery store environment as well as influence marketing decisions.
The research efforts of Moschis, Curasi and Bellenger (2004) along with Pettigrew, Mizerski and Donovan’s (2005) work suggests how to improve customer loyalty and projected success in the future marketplace. Addressing customer concerns by actively changing the negatively perceived attributes will support their competitive advantage in the marketplace.

Aylott and Mitchell’s (1998) study suggests that retailers need to consider how a given customer perceives the task of grocery shopping. If shopping for food is perceived as entertainment or is a pleasurable experience, then the likelihood of revenues will increase as will customer loyalty. This study suggests that if a retailer is concerned about food shopping as an experience rather than as a means of obtaining food and personal items, then fewer people will perceive food shopping as a chore.

Richard Leventhal (1997) suggests five key marketing approaches based on a book by D. B. Wolfe (1990) that claims it makes more sense to market to life stages and generational traits than chronological age because personal traits remain the same throughout life. Wolfe states that as people grow older, they cognitively retain childhood subjectivity along with adult reasoning skills such as practicality, objectivity and cost/benefit evaluations. The five marketing approaches begin with autonomy. This trait becomes evident by age two but is central to our existence by the time we are 55+ and not only impacts our physical abilities but significantly impacts our mental capacities. It has been previously suggested that grocery shopping for older people is a social outlet or social activity. This notion supports connectedness with friends and community which is the second trait. The desire to expand a social network beyond family to community connectedness gives rise to the third trait of
altruism. Leventhal (1997) points out that many seniors who are offered discounts prefer to donate the amount of that discount to a philanthropic cause. This act of giving back supports the sense that they contribute to make the world a better place, even after they have retired. The fourth and fifth traits work closely together. Revitalization and personal growth allow a person to remain cognitively challenged and better connected to family, friends and community. Cognitive sharpness helps to support the ability to remain living and functioning independently.

An awareness of these five traits will help retailers understand the aging consumers’ values. Older people don’t want gimmicks, just facts when making their purchasing decisions. Making sure the facts are available makes older people believe the marketer is more trustworthy. They take their time in evaluating costs and benefits and are not easily swayed by peers (Leventhal, 1997).

Problem identification

The work of Hare, Kirk and Lang (1999) suggests that levels of dissatisfaction experienced by an older population relate to needs and expectations of the physical environment not being met. Through a series of performance evaluations, Hare suggests that older people tend to adapt to public environments rather than bring awareness of their needs or expectations into the design of public environments. In many instances, older people require accompaniment in order to complete grocery shopping tasks due to challenges which include maneuvering doorways, crowds, lengths and widths of aisles, store layouts, shelf heights or wayfinding difficulties to name a few. This situation promotes dependence
upon others in order to accomplish a most basic and necessary life task.

At all ages and in all environments, humans have a basic need for self-reliance in an effort to maintain a sense of empowerment, self-esteem or sense of worth, all of which are subjective personal assessments to measure quality of life (Langlois and Anderson, 2002).

As we enter into the 21st century, U. S. Bureau of Labor Statistics reports economics and marketing tends to be concerned with fair trade practices, value, quality, convenience, local production, green practices (organic) and availability of multiple brands of merchandise. (Cohen, 2002; Fishman, 2006; U. S. Department of Labor, 2009). Modern architecture tends to be concerned about material applications that promote a healthier environment and creating new and exciting environments which are visually appealing (Kopec, 2006; Lang, 1987). While these focuses are important, public architecture and more specifically grocery stores as evidenced by Hare’s work, do not meet the expectations and needs of elderly adults in a manner that supports fully independent shopping and satisfied customers.

**Significance of the study**

Design features that are considered necessary and those that may be considered as amenities change over time and are defined differently by each person. Interior designers, have an opportunity to create environments that preserve dignity and support independence for an aging population. Subjective perception of environmental stimuli is very individual and is influenced by a number of factors which are based on biological differences, environmental perception and the interaction of the two. Understanding how people perceive environmental stimuli is central to the design process and consistently
satisfactory results (Kopec, 2006). Basing design solutions upon the perceptions of aging user expectations, needs and abilities, the grocery shopping experience will become easier and more enjoyable for everyone.

The purpose of this study is to understand the needs and expectations of aging adults in the grocery store environment, identify challenges they encounter within this environment and identify suggestions for improving their experience. By having participants discuss and explain desirable design feature attributes the designer can create environments that better satisfy the aging population’s needs and expectations. This study suggests that developing design alternatives based on user input would preserve an aging populations confidence in their own abilities; resulting in a supportive environment that is perceived to enhance independence in accomplishing shopping goals.

The supermarket industry has been shown to be one of the most important in the daily lives of aging consumers (Pettigrew et al., 2005). Retailers need to pay close attention to the needs and expectations of the growing 65+ cohort in order to remain competitive in the marketplace. The U. S. Bureau of Labor Statistics (2009) reports that the largest overall percentage of money spent at grocery stores is spent by the 65+ age group. With the remarkable increase in numbers expected for this population segment, this group is likely to have significant impact on American society and the global economy.

Objectives

Based on the following objectives, this study reveals benefits in developing design strategies to accommodate changing needs, functional abilities and expectations of an aging
population based on user input. In addition to significant benefits in the design of built environments that support end user changes as a result of aging.

1. Identify specific design features within the grocery store environment that consistently present physical challenges for a 65+ population.

2. Identify specific design features within the grocery store environment that consistently offer support for optimal independent physical functioning for a 65+ population.

3. Gain understanding through discussion as to how these identified design features impede or support independent performance based on the user’s perceptions. This includes how the user currently manages identified challenges or utilizes support features in an effort to accomplish the task of grocery shopping.

4. Discuss and understand what the end user believes to be reasonable expectations for adaptation of the grocery store environment. As a result, development of alternative design feature solutions based on user input will preserve an aging population’s confidence in their own abilities (resulting in a supportive environment that is perceived to enhance independence in accomplishing shopping goals).

5. Upon conclusion of this study, grocery retailers have an opportunity to consider new marketing approaches based on the expectations and needs of a growing population segment.
Research questions

1. Do individuals aged 65+ believe their needs, abilities, attitudes, expectations, preferences and perceptions differ from those aged under 65, if so in what ways?

2. In what ways should environmental design features within a grocery store setting supplement the abilities of an aging population so they can achieve optimal functioning capacity? This means that they are capable of performing grocery shopping tasks independent of help from others. What are their expectations for changes within the grocery retail environment?

3. Person-environment theories propose constructing man-made environments that fit the needs, abilities and expectations of the users. For architecture, that means continually adjusting the environment to fit changing needs. Should design professionals be concerned about implementing design features that would enhance independent grocery shopping abilities to support an aging population so that they can more easily perform independent activities of daily living (IADLs)? Or, is it more desirable to maintain the current grocery store environments and rely on community assistance in the aging populations’ ability to complete the tasks of grocery shopping?

4. For the 65+ population, what design features have become increasingly difficult to manage in an effort to accomplish independent grocery shopping?

5. What design features currently exist for the 65+ population that support their ability to accomplish independent grocery shopping?
6. In what ways does the aging population believe implementing user identified design feature changes would result in a greater independence in grocery shopping for an aging population? How would it increase their satisfaction with the shopping environment and experience, thereby resulting in improved store loyalty? Is there a need to act upon alternative design feature solutions or are the identified challenges too inconsistent and infrequent to be of concern?

**Limitations**

Existing literature that evaluated the grocery store environment was difficult to locate. The studies that are referenced in the include literature review chapter are somewhat dated. The most recent majority of research has been conducted in the 1980s and early 1990s. While the basic person-environment theories are timeless, they have mainly been applied to residential spaces for older people and considered in occupation and social or professional organizational fit.

The participant sample for this study is one of convenience. Participation in this study was voluntary and based in a small university town in the Midwest. Responses may depend upon what any one individual feels comfortable sharing and may not be fully representative of all recognized challenges faced within the grocery store setting. Some participants may not have full recognition of a challenge they experience given the fact they have unknowingly adapted their behaviors gradually over time to meet the shortcomings of the environment.
Individuals not participating in the study could have different responses based on culture, geographic region, education level, income levels, current or former employment status and gender. Additionally, individual responses may depend upon the physical layout and design features of the grocery retailer most frequented by any one person. Based on the study location and the small sample size, responses may not be consistent and nationally representative for the intended larger demographic group.

This study is intended to offer an overall perspective of changing needs, updating designers and service providers in an effort to improve the environment and experience of grocery shopping.

Assumptions

Individuals 65 years of age and older, living independently in retirement communities in a small college town, will be interested in participating and freely share their opinions regarding their grocery shopping experiences.

Focus group discussions will reveal design features within the grocery store setting that present challenges either experienced by an individual or by a greater percentage of the group. Discussion will result in alternative design solutions that they believe may improve how they function within the environment of the grocery store.

Thesis organization

This study is organized into five chapters. Chapter one is introductory and covers a brief background of the recognized trend: individuals aged 65+ prefer to age in place and
gradually physical changes of normal aging present challenges within built public environments, in particular grocery stores. Development of the study is based upon theories of person-environment fit and the body of work that has been done by Caroline Hare in the grocery store setting. Also included in this chapter are demographic trends and population changes, the problem statement and significance of the study, objectives, research questions, limitations and assumptions of the study. Chapter two gives a review of the literature including, normal aging changes, environmental theory, theories regarding age and the environment and previous grocery store research. Chapter three presents the methods used to carry out the study. Chapter four is the actual results and discussion of the data obtained from the focus group meetings. Chapter five offers an interpretation of the data, summary and conclusion of the study as well as recommendations for further research. Finally, the appendix section contains the application submitted to and approved by the Office of Responsible Research at Iowa State University, the focus group invitation notice that was posted on bulletin boards and included in participant newsletters, the informed consent handout, and the question framework from which the focus group discussions were guided.
Chapter Two: Review of the literature

Research base for this study

Caroline Hare’s work (1999 and 2003) focuses on satisfaction with the grocery retail shopping experience and notes key areas of dissatisfaction within an aging population. She asserts that customer satisfaction is what drives success for any retail environment and affords a competitive advantage in the highly competitive retail food industry through cultivating customer loyalty. Hare points out many areas influence customer satisfaction, but two areas are particularly significant to this current study - the internal store environment and user accessibility. Hare maintains that it is difficult to separate an interior environment from its exterior environment and customer service because they are integrated and need to be in balance to promote a satisfactory grocery shopping experience.

One key area of concern is the actual store environment and the design features within that space. This current study limits the exterior experience to activities related to the point of entry to the grocery store. So, while Hare discusses the businesses in close proximity to the grocery store and the distance from residences, these are not taken into consideration for this study. Particular challenges recognized by her work (and others such as Mason and Bearden, 1979 and Oates, Shufeldt and Vaught, 1996) are overall accessibility, reach of merchandise from shelving, inability to read pricing information, lack of seating throughout the store, inability to locate restrooms, difficulty managing carts, special needs at the
checkout counters, difficulty locating items and overall wayfinding in the store.

Since the 1970s, there have been studies that specifically have asked what older people identified as needs or concerns regarding their ability to independently function in the retail environment. Lambert (1979) conducted audio taped interviews with several elderly folks based on a predetermined set of issues thought to be of concern by the researcher. Results revealed that common concerns were with transportation and wayfinding. Many did not believe that store signage was helpful and as a result, a customer was forced to wander the store in hopes of finding what they wanted. Other concerns include an inability to read pricing information routinely placed on the edge of store shelving, having to stand for long periods of time, not being able to sit briefly between shopping aisles, reach challenges with shelving and displays, and inability to find restrooms. Lamberts study respondents suggested grouping items that would appeal to a population segment. In the grocery store, for example, that would mean distinct places available for grouping staple items, ethnic foods and seasonal items for example. They also suggested having designated hours specifically for older shoppers with extra discounts and that carts accommodate walker storage. It should be noted that concerns identified in Lambert’s study are also identified by others such as Hare (2003), Mason and Bearden (1979), Oates, Schufeldt and Vaught (1996) - and in this study 20 years later. This means that older people have continued to experience the same challenges without significant efforts having been attempted to resolve their concerns for over two decades. Lambert’s study suggested that retailers who focused efforts on meeting the needs of an elderly population segment have profited. The resulting data of the studies included in this paper offers support and inspiration for
designers and retailers to actively pursue discovering and understanding the challenges the elderly experience in the grocery store setting. Not only in an effort to improve the experiences of a growing percentage of their customer base but to enhance customer loyalty and profits. If profiting was possible from an increasing number of people over the age of 65 in 1979, consider the possibilities for increased retail profit due to the increase in this population segment in 2010 and beyond.

In 1985, Lumkin, Greenberg and Goldstucker conducted a study to discover what grocery store attributes were important to individuals over the age of 65. Their interest was not limited to design features but focused on a wide range of determinants for continued patronage. In an effort to establish importance of store attributes Lumkin, et al. used a random sampling mail questionnaire to assess what attributes were important enough to affect the choice of which grocery store to shop. Within this questionnaire, further information was explored as to how stores differed in these attributes and if it was significant to the patron, then it was considered to be a “determinant” according to the model of Myers and Alpert (1968). This model originally was developed to try to understand and measure the meaning people give to any one particular attribute within a retail environment.

Responses were categorized according to convenience of store proximity, physical environment, price and quality and special needs of an aging population. Results showed that there was indeed a significant difference in the way older consumers decide where to grocery shop based on their own needs, abilities and expectations.

It is of particular interest that many of the same identified attributes in Lumkin’s (1985)
study are also recognized in this current study, but in 1985 the actual physical
environmental determinants were ranked relatively low. Lumkin et al. (1985) found that
perceived value, price and quality were the highest ranked determinants for store
patronage. Wayfinding and parking proximity continue to be concerns for this population.

Theories

Social science theories concerning the influence of place upon personal development
have been studied for more than 100 years. During the 1980s, however, a narrowing in
scope to learn about place, fit and personal development as they relate to an aging
population. This narrowing of scope took place along with a new focus on the study of aging
we now refer to as gerontology (Moody, 2009). This is an important distinction because age
has now become an important factor in addition to ethnicity, socialization, economics,
politics, geographical differences, level of education and occupation that combine to explain
generational behavior and expectations of specific cohorts and the spaces they occupy.
While we know and accept each of our individual differences as people, cohorts share
common experiences based on chronological age or place in history.

As a component of the person-environment model (Lawton, 1997), the person is ever
changing; each possess unique qualities that constantly respond to or interact with stimuli
within an environment. These individual qualities whether conscious or subconscious
determine function and behavior within an environment. The other component to this
model is the environment. It too is ever changing and can both influence behavior and be
influenced by behavior. Likewise the environment can enable function or constrain it
(Keirnat, 1982; Law, 1991; Lawton, 1986). Of the two components, the environment is easier to manipulate. The Ecological Human Performance Framework is based on this model but expands it to consider personal attributes both conscious (such as preferences or determination) and subconscious (such as culture or cognitive status) that influence personal function within an environment (Dunn, Brown and McGuigan, 1994). This theory poses that people naturally interact with the environment in such a way that a fine natural balance will either be experienced or there will be an extreme imbalance that will disrupt functioning within this human and environment ecosystem.

**Environmental gerontology**

Environmental gerontology suggests that aging is influenced and shaped by the environments we occupy. Normal age-related losses and the state of cognitive abilities have a direct relationship with the places elderly people inhabit (Lawton and Nahemow, 1973). Lawton’s (1973) environmental press model states that if an environment presents too much stress or challenge then there will be a marked decline in personal competence. For the purposes of this model, competence refers to both mental and physical capacities (Kail and Cavanaugh, 2008). Therefore, observed behavior is an interaction of a person’s physical and psychological inputs and responses - both subjective and objective (Lewin, 1951). These interactions can have both adaptive and maladaptive impacts (Lawton, 1977). Lawton (1986) considers the aging person responding to the environment based on personal competence both mental and physical. A high level of competence should slightly exceed or at least balance with environmental press to achieve optimal function.

There are twelve environment-behavior principles that provide a framework from which
design decisions can be based and help to manage the design process more effectively to optimally benefit an aging population (Pynoos and Regnier, 1991). Some of these principles include autonomy, safety, social interaction and adaptability. The goal is to minimize physical challenge through enhancing the environment to support a more positive outcome that will elevate the ability for independence (Pynoos, Nishita and Perelman, 2003). The design challenge comes in creating an environment that doesn’t present too much challenge, so that independence is achievable, but creates an environment that doesn’t overcompensate everything for a person. To redesign an environment to support an aging individual, the existing environment must already afford some degree of compatibility before any re-evaluation of design attributes can be considered to enhance a person’s ability to function independently (Kaplan, 1983).

**Congruence model**

This paper is concerned with fitting the design features of a grocery store environment with the physical abilities of the aging patrons. In 1982, Kahana presented the congruence model for the person-environmental fit theory. This is based on the idea that people seek environments that meet their needs. Environments vary greatly in the ability to meet the needs of people just as the needs of people vary greatly, and if a match is not found, then stress is produced that presents barriers to function. In later years, further developments lead to the division of this model into the complementary and the supplementary person-environment congruence models to describe the environment according to the people who inhabit it. The complementary congruence model is based on the idea that a person’s resources or abilities can compensate for the weaknesses within an environment (Carp
and Carp, 1984; Muchinsky and Monahan, 1987). This is the case that most able bodied people experience in all public spaces; they rely upon their own capabilities to get what they need. Over time, these same people begin experiencing challenges and they learn to adapt or make changes in their behavior to get by; this idea gives rise to the philosophy of people changing to fit the environment (Cable and Edwards, 2004; Muchinsky and Monahan, 1987). The supplementary congruence model considers how the person and the environment fit together or how they can function together to meet optimal achievement. This idea brings forth the question, “how can an environment change to improve the function of the person” (Cable and Edwards, 2004)? The primary measure of environmental success is through a subjectively reported level of satisfaction; or how well an individual believes the environment supports their needs and expectations (Muchinsky and Monahan, 1987).

Figure 1. Diagrammatic representation of Lawton and Nahemow’s 1973) Environmental Press Model super imposed with the Congruency Model (Carp and Carp, 1984; Kahana, 1882; Muchinsky and Monahan, 1987).
Figure 1 visually presents Lawton’s theory of Environmental Press but it also incorporates the expanded original theory of Kahana’s Congruence model. There is a fine line that represents the optimal function of any one individual and the areas on either side of this line represent either what individuals need (supplemental congruence) from the environment to achieve optimal functioning or what they can bring to the environment (complementary congruence) to achieve optimal functioning.

**Psychological Influences**

What is it about a particular space that encourages people to return to it? The answer to this question can have many answers but there are some general similarities to very individual responses. Key features of everyday living include predictability, control, security and protection. These factors contribute heavily to the reasons why people choose to live and shop where they do (Cohen, 2002). Other factors include amenities, perceived costs or benefits, (Norris-Baker and Scheidt, 1994) pleasant memorable impression, familiarity and a sense of usability (Cohen, 2002). Spaces perceived as manageable, those that are perceived at a human scale, provide psychological comfort and a sense of ability to maneuver about the space. With repeated exposure and a sense that rewards accrue from a particular place, people tend to formulate preferences for shopping environments. While a sense of vastness in nature is inspiring and engenders an appreciation of wide openness and beauty, it can often induce discomfort in enclosed spaces (Marsden, 2005) thereby leading to a mismatch between a person and an environment. If a design feature is significant enough and leads to an undesirable experience then people will tend to forego shopping even if the rest of the shopping experience would be desirable (Markin, Lillis and Narayana, 1976).
Environmental design becomes part of the human experience in the attempt to satisfy user needs, preferences and expectations. The environment immediately interacts with an individual to support psychological and physical comfort and establishes a memorable connection (Kopec, 2006).

In regard to the exploration of design strategies for the retail grocery environment, the ability to continually remake the space is key to holding customer interest and influencing or directing their attention (Cohen, 2002). Customer appeal and satisfaction occur before the consumer even enters the space or any shopping tasks begin. By planning and designing environments according to perceived user-preferred changes, public settings can be organized to eliminate environmental deficiencies (Markin et al., 1976). Consider for example a building’s entrance; it is an important transition between the indoor and outdoor environments. Building entries stimulate interest, make the first impression and influence the mood or emotion that someone will experience within the space (Farrell, 2003).

**Lifestyle trends**

Psychological perception and mental health significantly influence one’s ability to care for oneself and live independently. The question could be asked, “Why be concerned about the environmental fit of public spaces and an aging population?" The answer relates to the fact that has already been stated; 82% of the population segment over age 65 want to continue living independently as long as possible and are willing to make changes to retain their independence (Bayer and Harper, 2000). This idea is a phenomenon that has in recent years been referred to as, “aging in place.” Successful efforts to age in place depend upon
an individual's ability to accomplish tasks both in the household and outside of the household (Lawton, 1986; Shephard, 1998). So, considering the environment outside the home is a necessary step when evaluating an ability to age in place, one of the key environments that must be evaluated is the grocery store setting.

**Aging in place**

Currently the average life expectancy is approximately 76 years but is expected to rise to 80-83 years during the 21st century (Bemben, 2002; Moody, 2010). There are many reasons the current elderly populations prefer to maintain their current living conditions: financial constraints, proximity to family and friends and familiarity of surroundings, all of which tend to increase security and psychological comfort. Familiarity of surroundings supports a decrease in negative outcomes such as falling or getting lost that can result from not knowing the layout of a new environment (Regnier, 2002). The “Aging in Place in America” study commissioned by Clarity and The EAR Foundation (2009), examined seniors’ and boomers’ attitudes on aging and independence (Mussman, 2009). The most significant fear of elders is losing their independence and having to move to a nursing home (Consumer Consortium of Assisted Living, 2010; Mussman, 2009). Study results revealed that even with the need for greater investments for structural remodeling and in home services, remaining at home provided a great deal more comfort and increased self-confidence. Managing daily tasks such as finances and housework and staying connected to an existing social network helped to maintain physical and cognitive skills (Golant, 1986; Mussman, 2009; Novelli, 2002). These are well documented facts and preferences of older people that have inspired the “aging in place” movement as evidenced by the results of many other
studies. (Newman, 2003; Newman, Zais and Struyk, 1994; Rowles, 1984). In an effort to support aging in place, public spaces must also be evaluated for the ease of use by older people. This study suggests that there are design feature changes that can be made to support independent shopping for older people elderly.

This information is relevant to this study because it emphasizes quite clearly that there is a majority of the elder population that continues to live independently and therefore reconsidering public spaces that they routinely visit should be of considerable interest to interior designers.

**Boomer expectations**

The boomer population is willing to change their residential situation, but it is less about the actual familiar surroundings and more about the amenities that a residential environment affords to age in place (Novelli, 2002). Exceptional comfort and functionality that will support independent living are of primary concern. Marketing companies have quickly learned that today’s elder individual is not the same as the soon to be retired aging individual. Key marketing influences focus on amenities and comforts to sell various residential options to boomers. Boomers are willing to relocate with the intention to then begin to age in place (Morgan and Levy, 2002). This has been an inspiration for designers and developers to create residential communities that specifically exist to meet the needs, preferences and expectations of an aging population. This paper suggests that this idea should be carried further than residential opportunities and reconsider public environments that these individuals routinely visit. Previously noted generational characteristics suggest
that future populations will expect design changes in grocery store environments that will support inevitable limits of aging.

**Normal aging changes**

**Physical change**

While most older people do have some altered chronic sensory conditions, it should be noted that there is extreme variation in sensory inputs that do need to be considered by a designer. There are many changes that occur in the human body with normal aging. For the purposes of this study, the focus is on sensory changes because it is through the senses that one interacts with and interprets meaning to stimuli within various environments. Age-related changes occur in each of the five senses though some are more obvious than others; sight and hearing seem to have the greatest effect on whether a person can maintain independent function (Novak, 2006).

Saxton and Etten (2002) state normal ocular changes include a reduction in tear production, a decrease in pupilary size, sensitivity to light, stiffening and yellowing of the lens, weakened ocular musculature and a decrease in an ability to sharply define objects. As a result, adjusting to light levels from light to dark and from outdoor to indoor takes longer. The lens becomes less transparent allowing less admitted light to scatter limiting the ability to discern fine details and increasing sensitivity to glare. The discoloration in the lens decreases the amount of light that is let into the eye causing everything to appear dimmer. There is a loss in sensitivity to color differentiation as everything begins to look grey. It is
also more difficult to distinguish between light and dark color contrasts. Weakened ocular muscles lead to a decreased ability to focus, a decrease in peripheral vision and limits the field of vision in varying degrees. Depth perception also becomes more difficult as a result of inefficient neural response (Arditi, 2005; Gordon, 2003; Novak, 2006.)

Auditory changes are very common though experienced to a slightly lesser degree than visual changes. Saxton and Etten (2002) point out that the first notable changes are a decreased ability to hear high frequencies (consonants) and gradual decline in ability to hear lower frequencies (vowels). They point out that distinguishing between hearing consonants and vowels used together in speech is difficult to understand and music tends to sound muffled. Auditory decline can promote a tendency toward social isolation and is often mistakenly interpreted by others as confusion or revealing signs of declining cognitive ability in an elderly person. These symptoms are a result of the stiffening of small inner ear bones and the thickening of the eardrum. It is not uncommon to experience ringing in the ears as well (Pichora-Fuller and Souza, 2003). For all people, the center for balance is located within the auditory system. Disturbances within this system as a result of infection or ossification can present challenges with balance and stability, and indirectly influence an individual’s mobility (Novak, 2006).

Muscle mass declines with age and neural response impulses become less efficient resulting in slower response time and muscle weakness. Hand grasp is not as strong as it used to be and it often takes more time to complete tasks. (Bemben, 2002; Novak, 2006; Saxton and Etten, 2002). These neural changes also decrease tactile sensitivity to interpret temperature and textural changes. Cartilage within the bone joints are far less elastic and
offer less cushion to absorb shock during basic mobility. In addition, ligaments and tendons are also less elastic making joints feel stiffer, thus contributing to mobility challenges (Saxton and Etten, 2002).

The skeletal bone structure also experiences changes. Bones harden and bone fiber density decreases. These changes subject an individual to decreased flexibility presenting challenges with reach and agility to maneuver in space. The spinal column also becomes compressed over time resulting in an alteration in perceived center of gravity. The vertebral column begins to slant forward and in an effort to balance the body, older people tend to stand with an anteriorly curved posture. This posture limits their visual field and limits one’s ability to grasp items located above the head. (Novak, 2006; Saxton and Etten, 2002).

Age-related changes are inevitable. However many athletic physiologists agree that a skill or movement not routinely used or practiced results in a loss of ability to perform certain tasks (Shephard, 1998).

It is essential for an interior designer to understand the normal age-related changes that all people eventually experience. In an effort to create environments that will support independence, understanding how normal changes influence functionality will result in better design of attributes and patterns of use within the grocery store environment.

**Environmental adaptations to consider with aging**

Efforts to support visual capabilities need to be concerned with illumination levels and contrast of objects. Optimal lighting avoids glare but is abundant within the space. The best lighting options are indirect or direct-indirect lighting that use an opaque filter (Gordon, 2003). Optimizing “grey” color values makes contrasts between fonts and backgrounds
more successful. A general rule for color guidance is to use saturated colors that are far from each other on the color spectrum (Arditi, 2005; O’Connor and Davis, 2005).

An ability to read signage influences one’s ability to function independently. In addition to illumination and color, labeling and signage should be concerned about font style, size and placement of textual information. Uppercase font styles that do not include small tag features (san serif) are the best choices for clarity. Using a bold print in addition to allowing for some interlettering space will help with legibility (Arditi, 2005; Mahnke and Mahnke, 1987).

Auditory support is based on placement and material choices. The optimal environment that will support an older individual’s ability to perceive sound is a space with lower ceilings to minimize echoes. If this is not possible, using sound absorbing materials will help decrease excess noise or background noise so that proximal conversation can be heard more clearly, interpreted and responded to. Grocery shopping in large groups or in crowded spaces makes it nearly impossible to hear and understand normal conversations. In public places such as grocery stores, placement of a speaker system to announce specials or sales is recommended (Egan, 2007).

The previous section pointed out typical age-related changes that include vision, hearing and mobility. Changes in mobility are influenced by muscle and skeletal changes and are the most obvious to other people. Interventions that support mobility and reach, accessibility, balance, muscle strength and stamina are supported by the guidelines of the American Disability Act for accessibility (Department of Justice, 1994; www.ada.gov/stdspdf.htm), the
principles of universal design (www.design.ncsu.edu/cud) and visitability (Kochera, 2002; Maisel, 2006; Maisel, Smith and Steinfeld, 2008; www.visitability.org).

Considerations include wider doorway access, non-slip flooring, seating options throughout the grocery store for purposes of rest and socialization, shelving options and fixture configurations that allow obtaining desirable merchandise more easily, and the availability of several variations of wayfinding techniques that can support an ability to locate desired items throughout the shopping experience.

The following diagram (figure 2) illustrates where designers have the ability to influence the balance between the person and the environment. This intersection is referred to here as the region of adaptive design. Adaptive design is a result of combining user-based performance ability (physical challenge), user-based mental interpretation (individual determination), evidence based research and creativity of design professionals to significantly influence performance competencies within an environment. For this study, this is the area where the inputs of an elderly independent community can combine with design professionals’ creativity to solve problems or challenges they encounter in the public grocery store settings. By working together, new ideas or old ideas used in a new way can solve performance challenges to support independent functioning. Adaptive design as it is represented here considers environmental physicalities and resources that can be enhanced, as well as all personal competencies and available resources that can be called upon to support optimal independent functioning. For this study, the task of concern is grocery shopping.
Figure 2. Diagrammatic representation of the realm for design intervention using the person-environment theories. Original schematic by S. Steenblock.

History of the development of the grocery store

Since the beginning of time, humans have actively foraged and hunted for food. Food preparation and consumption is a foundation in Maslow’s hierarchy of basic human needs. In our modern day society, convenient access to food markets is considered a basic quality of life issue. Ease of access connects people to the food industry which has become one of the largest industries in the world (Gottlieb, 2006; U. S. Bureau of Labor Statistics, 2009). Post-industrial revolution brought with it specialization and the food market which became a necessary common space reaching across all classes and nationalities to bring participants face to face (Mayo, 1993).

What is shopping?

Shopping is a complex issue of interaction between a person and a place. Generally people don’t think about shopping much and tend to take for granted that shopping
opportunities exist with an abundance of choices that will likely meet our needs. Some people shop to pursue happiness, some to relieve boredom, some out of necessity and some as a social activity. In the United States, shopping is influenced by the need to satisfy basic human needs, individuality, the culture each of us associates ourselves with, core societal values such as freedom of choice, entertainment/hobbies, and material comfort. (Farrell, 2003). All spaces specifically designed and built for shopping are carefully planned and are intended to reflect what behavioral scientists have learned from societal norms that are influenced by physical ability, personal perception, geography, psychology and the environment (Farrell, 2003).

**Grocery stores**

The American marketplace emerged initially from trading posts set up in the early colonial era and spread with the American expansion westward. With the industrial revolution, immigration and urbanization, the concepts of the ancient agora and medieval piazzas gave birth to the concept of mall style shopping for food, clothing and other items (Mayo, 1993).

Initially the American version was an outdoor kiosk, market-style shopping with limited hours and days. Over the years, there have been many changes in the built structures as well as their design features (Kahn and McAlister, 1997) such as the use of the adding machine, instituting the barcode for digital scanning and electronic scanning of goods (Brock, 1981; Kahn and McAlister, 1997). Digital technology has significantly influenced the manner by which people buy and pay for goods (Walsh, 1993).

The settings in which consumer goods are purchased have revealed changes over the
years in that no one ever needs to leave home to buy food, clothing, car insurance or obtain medical advice. Those who do continue to venture out of the home to experience the shopping environment, have in recent years witnessed “convenience shopping.” This trend first began to emerge when populations grew larger while at the same time small town America began shrinking. Urban settings offered a more efficient model for everything from transportation, housing and consumption of goods (Gwynn, 2010). Sixty years ago the urban population was approximately twice that of the rural population. Today it is nearly four and a half times that of the rural population (Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, 2007). Small independent grocers and a few chain grocers began to consolidate stores and began to offer limited quantities of fresh meat products (Gwynn, 2010). Emphasis was on volume and a no frill environment that resulted in lower prices for goods. Due to the ability to buy in bulk and the introduction of nonfood items which emerged during the WW II era, and boomed during the post WW II era, the grocery market became known as the Supermarket (Mayo, 1993). Then mega discount stores emerged in the 1970s to offer merchandise at even lower costs. Grocery stores responded by expanding or adding to their departmental offerings of dairy, bakery, produce, butcher, pharmacy, banking, dry cleaning, cafe and personal hygiene. This concept has given birth to the latest idea most referred to as one-stop shopping at “Super” stores (Mayo, 1993).

**Turn of the century**

With the industrial revolution, specialization and immigration, many people moved to urban settings, and cities grew both in area and population. The urban population had
exceeded the rural population, and mass consumption was in its early stages. At the turn of the century grocery stores selling dry goods or non-perishables emerged with the recognition of chain stores. These remained simple assisted counter service and then grew larger to become self-service spaces similar to cafeterias hence were called groceterias. As part of the early strip mall, complementary businesses began to proximally locate and these developments were referred to as drive-in markets. These included businesses such as the butcher, the bakery, dairy vendors, general stores (also referred to as Dime stores) and fresh produce vendors (Gwynn, 2009).

Suburbia

As early as the 1920s, urban perimeter residential neighborhoods began to emerge and presented a need for community located retail offerings, which evolved to more efficient, regional models for items such as food, clothing and jewelry (Farrell, 2003). Small regional chain grocers began to expand to the urban outskirts because land was fairly inexpensive. Prior to the 1930s, grocer competition heated up and national mergers began which offered a great deal of power to those newly formed mega grocers leading to establishment of antitrust laws to regulate the industry. By the 1950s, suburbia had well been established because people believed living away from business was safer and provided a better environment to raise a family (Gwynn, 2009).

Discount store evolves

General or Dime stores were part of this grocery evolution and by the 1970s wanted in on the success. Owners expanded their properties and began to offer more product choices in their merchandise. They focused their efforts on non-food dry goods that could support
modern living, and the industry began to grow. There were more and larger competitors that made it difficult for the small family owned stores to survive. Mergers occurred and the result was large warehouse centers. In an effort to distinguish themselves from each other, upscale discount centers were born in the 1980s, marketing themselves as “high fashion” with “cutting edge” design (Gwynn, 2009).

**Big box**

Since the 1990s, the “Super” stores have started sprouting up across the nation. The idea of the big box is that frequently used services are made available all under one roof but unlike a shopping mall, all these services are run by the “Super” corporation. The basic idea is that offering the consumer the ability to shop for everything they need in one place will save them time (Gwynn, 2010). Frequently, available services include groceries, banks, hair and nail salons, opticians, pharmacy, restaurant, cleaners, florist, spirits, movie rental and coffee shops to name a few. These initially were seen in suburban regions and began to surface in the Midwest’s rural regions in the last 7 to 10 years.

Convenience shopping has evolved as a result of the increased value of time as a commodity; it seems there never is enough of it (Janish, 2010). With the women’s liberation movement of the 1950s approximately 40% of all women aged 25 to 54 worked outside the home. A recent estimate (2000) is that 77% of all women aged 25 to 54 now work outside the home (Porter, 2006) for many reasons, one of which is the fact women want to be able to offer their children opportunities they did not have in our childhoods (Gerson, 1986). It seems the pace of the typical family schedule has dramatically accelerated in the last 20 years. Historically, there was time for leisure and relaxation on a daily basis but now, with
both parents typically working, school-related activities for the kids creep into the evening, along with homework and housework, there aren't enough hours in a day (Kleiber, 2005). This phenomenon supports the “super” store concept that has come to be recognized as convenience shopping at big box centers. American society values an ability to make the best use of time and to get the most value per dollar.

The focus on volume and choice requires the “super” stores to exist in considerably large building structures. These large spaces are difficult for an older person to manage. An elderly consumer typically has begun to experience declines in physical abilities; their individual resources have declined. Wayfinding is a challenge in these large buildings as is reading signage. The requirement for physical energy and time commitment to complete shopping has increased which results in having to stand or walk for longer periods of time. The complementary congruency model for the person-environment fit theory requires reliance upon individual ability or resources to effectively function within a built environment. The experience of entering these vast buildings can be intimidating and confusing. Where does one begin to locate the items needed? How does one begin to learn where everything is and how to reach items that are piled so high on the shelves or bins?

The history of the grocery store setting is relevant background information to understand perceptions, attitudes and preferences that likely differ from the designers due to generational influences. This is significant because results of the data from this study reveal that older people prefer to grocery shop in smaller more traditional settings rather than large convenience centers.
Humanistic design

The experience of grocery shopping is more than marketing strategies. Ideally it should account for what the users are looking for and how they perceive the ease of use of the space. There is very little research based on the opinions and experiences of an aging population; most result from interpretive impressions, conclusions, projections or predictions of researchers and policy makers. As will be explored in the following paragraphs and chapter, most of the research is based on the tools available for evaluating the person-environment fit within the residential setting. These evaluations have tried to explain how satisfaction, universal design principles, function and appearance of a space, and personalization of a space are influenced by a person and the environment. By using these same ideas, the grocery store setting can also be evaluated but will be considered along with the opinions and experiences of people aged 65+. Discussions based on their needs and wants will evaluate satisfaction, usability of design features, store function and appearance, and their preferences.

Design phases

User-centered design (UCD) is a sub-category of humanistic design. UCD most practically applied begins after the precedent research and multidisciplinary scientific collaboration phase. There are four principles in UCD that are comparable to examination of what has been learned in previous phases of design research. The first principle, task analysis, re-exams the challenges presented. This study exercises this phase through a review of the literature and preliminary in-field observation. It verifies that every aspect of the challenge has been addressed. Meaning is assigned to observations and assumptions are developed
by the designer. Focus group discussions explain and ratify previously observed data and assign meaning to the data. The second principle, data analysis, is concerned with what can be assumed, learned or postulated, and verifies the gathered information. The third principle, consideration of new design developments, is based on user inputs and the development of prototypes that include thoughtful consideration of trade-offs and cost-benefit analysis. The fourth principle compares and contrasts utility versus usability. Utility considers whether requirements have been met, function has been addressed, objectives of the users have been met, performance and preferences have been considered. Usability considers ease of use and can be a measure of person-environment fit (Fisk et al., 2009; Rosenfeld and Chapman, 2008).

**Previous research**

**Design features**

Goodwin and McElwee (1999) conducted focus groups with older people to discover what design features they believed to be of particular interest regarding grocery shopping and whether these factors changed over time. The top seven design features of interest were ease at checkout, close parking, senior discounts, assistance within the store, availability of brands known to consumers, sense of purchasing value and sense of purchasing quality. They developed a list of 23 different design features for discussion, some of which were also included in this paper such as use of technology, assistance with locating goods, availability of single servings, clean accessible toilets, optimal lighting, groceries sacked for consumers, avoiding waiting lines, easy checkout (a place especially for
senior checkout), seating in and around the store, uncluttered aisles, in-store brand variety, wide accessible entrances/exits and a manageable layout. Their review of previous literature revealed that issues concerning access, mobility and transportation have remained of concern since the 1970s.

Using a random sample for participation in a questionnaire, Moschis et al. (2004) aimed to discover which grocery store design features attracted and retained an aging population when selecting a grocery store. Fourteen possible reasons were revealed, some of which included design features that are also discussed in this study. Examples include ease of locating and obtaining items, friendly customer service available to assist within store location and getting purchases to vehicles.

The purpose of this study was to identify challenges that elderly people encounter with use of existing design features and store layout. Some of the discussions did reveal that many elderly people feel grocery shopping is a chore because of the challenges they encounter which will be discussed in chapter four, the data results. A study conducted in the United Kingdom by Aylott and Mitchell (1998) suggests that grocery shopping has become a chore for the population as a whole and that shoppers of all ages prefer to spend as little time shopping as possible. Food shopping is perceived as the most distressing form of shopping. Aylott and Mitchell sought to identify stressors associated with grocery shopping because they reported that food shopping was the largest household expenditure. They theorized that stress is inevitable in any person’s life but good stress (eustress) can enhance the food shopping experience where as bad stress (distress) can lead to the perception that food shopping is a chore. Understanding the factors that influenced each
type of stress could then be utilized to resolve undesirable attributes and enhance desirable attributes. This ultimately becomes of great interest to retailers. Aylott and Mitchell identified three main categories of stressors: sensory inputs and social or structural factors, and time pressure. Sensory stimuli were seen to be easy ways to manipulate pleasurable experiences through scent, noise or music, lighting variation and temperature control. Pleasurable experiences increase purchasing. The social or structural factors involved traffic flow, layout, fixtural ease of use, uncluttered aisles, poor label/price recognition and issues with cart usage. These factors present design challenges for both the customers and the designers. If sensory and social/structural factors are optimized then time pressure frequently becomes less stressful simply by attempting to resolve the other concerns.

Pettigrew et al. (2005) reported that there has been little research done in understanding and discovering attributes that an aging population believes to be of concern in the grocery store. Most of the literature discusses customer service and transportation issues including parking accessibility. Pettigrew points out that the older population segment is very complex and not homogenous. They have a variety of needs and preferences but do share some common concerns such as functionality of general store layout, aisles and fixtures, reduction in risk, convenience and availability of familiar brands without having too much choice. These factors are of particular interest to design and gerontological science because grocery shopping is not only task oriented but is also a valued source for socialization, entertainment and exercise. Pettigrew’s study noted that customer service and shopping carts were of particular concern for reasons that resulted from physical changes that relate to normal aging.
What we have learned

Over the past two or three decades there have been very few studies that have tried to identify preferences of older people in the grocery store setting. The most notable significant interior design features that continue to challenge are associated with vision and mobility. Accessibility concerns remain in association with parking availability, outdoor cart storage and ambulation into the grocery store setting.

Older people report they can continue to “manage” to function in the existing environment. The goal of practicing user-centered design based on person-environment theories is to create environments that enable higher human function. In addition, a clear understanding of this information will contribute to the body of knowledge for the design and social science professions. Input regarding perceptions, ideas, opinions, concerns, thoughts and attitudes of an aging population segment will significantly influence man-made environments of today and tomorrow.
Chapter Three: Methods

This chapter summarizes the research methods used in the study. The following sections are included in this chapter: (A) Previous Research, (B) Study Participants, (C) Instruments, (D) Research procedure, (E) Data analysis, (F) Limitations of the study.

Previous research: development of measurement tools

Though very few examples of measureable tools are available in the literature to evaluate the satisfaction of any particular environment, the Personal Living Space Que Inventory (PLSQI) has some value (Gosling, Craik, Martin and Pryor, 2005). This tool was developed to test the evaluation of one room in a residential space. Six criteria determine the degree of satisfaction to which any one environment meets the needs and expectations of the inhabitant. First, the tool should be widely applicable to many different spaces; it should be adaptable from primary to secondary or tertiary spaces. If the tool is flexible then it can be useful in evaluating residential and public environments. Second, the tool should include evaluation of common and unique features within a space that will help define the occupants. That is, it should be able to consider evidence of occupation and how this environment is actually used versus intended to be used. The third criterion elaborates on the second criterion’s exploration of the space use. Essentially this step evaluates influences of region or culture - uniqueness of place. The fourth criterion acknowledges the need for a comprehensive evaluation of sensory inputs, especially sound, light and smell. The fifth criterion provides for an estimate of whether or not it is believed that previous results of the first four criteria can be generalized across different people, groups and places. The
sixth criterion states that the tool should be manageable within a relatively short period of time - that is, one sitting accomplishes the goal of evaluation without considerable commitment of time (Gosling et al., 2005). While this study did not develop a tool, it focuses on advancing prior efforts of assessment and making connections between a person and the environment.

Previous research that influenced the development of the Personal Living Space Que Inventory (PLSQI) were Kasmar’s (1970) Environment Description Scale (EDS) and Lauman and House’s (1970) Living Room Consideration scale (LRC). The EDS is a set of 66 adjective pairs that describe the architectural environment in a broad sense and does include sensory and configural aspects. With a greater focus on the residential environment, the LRC contains 53 items that allow for more specific observation. It is conducted as a brief interview that provides both verbal interaction and territorial observation (Gosling et al., 2005).

Exercising the interview tool, Csikszentmihalyi and Rochberg-Halton (1981) devised a 41 category system to identify special items within a place that conveyed meaning of place and items and could decipher satisfaction of an environment. Vinsel, Brown, Altman and Foss (1980) used photographic and content analysis to evaluate the ability to personalize a space to establish place satisfaction.

Amerigo and Aragones (1997) used a questionnaire for residential satisfaction as a conceptual framework to identify perceived environmental attributes that promoted increased satisfaction. They proposed that there was a dynamic, continually evolving interaction between a person and the environment that explained the perceived evaluated
quality of place and could then predict behavior. Their questionnaire, the Perceived Environmental Quality Index (PEQI), identified some attributes that they categorized to explain how an individual evaluates a space. Some of these categories include safety, control, access and warmth/welcoming. They suggest balancing these categories would support individual and environment congruence to promote spatial satisfaction.

**Study Participants**

As evidenced in the review of current literature, the population segment over the age of 65 is predicted to grow dramatically in the near future. Therefore, because of a personal interest in the study of gerontology, code requirements for the Americans with Disabilities Act Accessibility Guidelines (ADAAG), universal design practices and humanistic design strategies, this data focuses on the changing needs of an aging population. The resulting information has great potential to influence the manner in which designers intend to build future grocery store environments, as well as remodeling efforts. Ultimately, the goal is to design environments that support human behavior or create environments that adapt to people rather than the traditional practice of people adapting to the environment.

The participant group for this study consisted of 73 individuals whose ages range from 65 to 106 years old, 21 men and 52 women. These individuals live independently in retirement communities in a small college town in the Midwest, either in an apartment or a townhome. They continue to cook, and shop for groceries independently at least twice a week. Most, though not all, have children of their own, some of whom live close by. All of the participants stated they have lived in this state most of their lives, or most of their married
lives, and have continued to live here because it is familiar to them.

Residential sights included a continuing care retirement community, a retired living center similar to assisted living but housed strictly independent older people, title 19 apartments that housed older people and an apartment complex that housed older people. All sights did routinely offer transportation to go grocery shopping however less than half of the participants actually used this mode of transportation, those that did said they sometimes used the scheduled facility transportation.

Since human subjects were involved in the study, the approval of the Human Subjects Review Committee at Iowa State University was obtained prior to conducting the study. Letters of consent for participation were obtained from the on-site manager, the activities director or chairman of the board of directors from four designated retirement communities. Site management preferred to contact residents to recruit participation themselves in an effort to protect personal information and so that they were aware of who had agreed to participate. In this manner, no phone or address list needed to be shared with the researcher. Documents submitted and approved by the Office of Responsible Research at Iowa State University are included in the Appendix.

**Instruments**

An objective of qualitative research is to help build understanding for a particular human issue through words and action (behaviors) rather than numbers or proof of an experimental test (Creswell, 1994). Qualitative data is by nature subjective. The ultimate goal is to discover and clarify how and why people interpret and assign meaning to the data,
also known as the emic perspective (Groat and Wong, 2002; Johnson, 1997). The job of the researcher is to explore an issue based on data that can be observed visually and heard. According to Denzin and Lincoln (1994), the optimal situations afford a natural setting familiar to the participants in an effort to more accurately interpret the meaning of the data being shared. The best method by which to collect data is human input; clearly describing observations is critical to ongoing interpretation of the data (Creswell, 1994).

The main focus of this study is to try to understand the interactive nature of people and the environments they inhabit. More specifically, to recognize and understand how the grocery store environment supports or impedes human behavior in an aging population by recognizing challenges evidenced by changing physical needs and abilities. Participant-based input is essentially the basis for promoting changes in the design features within environments that are anticipated to support independent functioning behavior by the end user.

For the purposes of convenience for data collection, participants needed to be focused samples rather than random samples. Residents of the selected retirement communities have diverse backgrounds and therefore offer a sample that would be more representative of the diversity within the aging population nationwide. Participant diversity is necessary to evaluate the design feature challenges that currently exist, how these challenges are experienced by different individuals and potential interventions that can be put in place to allow more easily managed efforts for independent functioning; results are applicable to a more general aging population. It is important to confirm that participants do their own grocery shopping at least twice a week, prepare their own meals and continue to live
independently even having experienced physical decline.

Qualitative methods such as non-participative complete observation and focus group discussions were used because the ultimate goal for this study was to collect a range of data from participants based on their experience and perceptions. The initial research questions did not have predetermined right or wrong answers but postulated there would be needs revealed that had not been previously noted either by end users or design professionals. Observation techniques (Given and Leckie, 2003; Golds, 1958, Gorman and Clayton, 2005; Pearsell, 1970) were conducted by the student researcher over a period of seven days at seven different grocery store sites in a small college town. An average of four hours was spent at each site posing as a shopper and taking notes based on what was seen, heard, smelled and experienced personally regarding environmental conditions. The student research behavior was conducted in this manner in an effort to remain as unobtrusive as possible (Chatman, 1992; Given and Leckie, 2003). Of particular interest was the 65+ year old shopper and the student’s perceived interpretations as to how these individuals interacted with the grocery store environment. Observation areas noted include the following:

- Use of entrances/exits (door width, number of entrances/exits, configuration for access; same site or separate site access, access from the parking lot)
- need for places to wait, seating availability
- cart use and preferences (access and storage proximity)
- aisle manipulation (traffic flow, tolerance for length of aisle, apparent stamina to complete the task, displays, flooring, seating needs)
• shelving ergodynamics ability (vertical, horizontal and depth reach, personal ability for balance and perceived muscle strength challenge)
• need to ask for assistance (includes locating item and obtaining items, perception of wayfinding abilities)
• ability to find and read merchandise information
• ability to navigate the space (this includes whether they could find their way around, ability to find and read signage, ability to locate items, departments and restrooms)
• use of available alternative services
• ease of checkout counter use and transporting goods
• note lighting of space (glare, shadows) and other sensory experiences such as noise, temperature, odors

The following observations served as the basis for developing the general framework for the focus group discussions. Usage of push carts was noted for the purposes of support and it was also noted that gait patterns tended to shuffle rather than present purposeful steps. Reach was an obvious challenge at aisle fixtures and produce displays; shoppers frequently used other grocery items to assist in obtaining higher items. Older shoppers tended to shop one side of an aisle then turn around and shop the other side of the aisle without an opportunity to rest in between. The freezer doors appeared to be heavy and difficult to manage. There were frequently issues with reach to obtain fresh meat products. Restocking during business hours tended to promote congestion and crowding in aisles. Many elderly shoppers appear to have some challenges interpreting signage and reading pricing
information located near shelf edges.

Questions and probes served to encourage participants’ discussion and clarify interpretations of the student researcher’s observations. The general framework of the focus group began with some opening questions that could help increase the potential that all members and the researcher could be comfortably at ease. Then each group member would introduce his or herself and share a comment regarding personal experience with grocery shopping today compared to many years ago. This set the stage for transitioning into questions regarding challenges they now experience within the grocery store environment (Krueger, 1994; Morgan, 1997). There were nine main questions, and each question had a list of probe questions that guided the discussion (Krueger, 1994; Morgan, 1997; Wheatley and Flexner, 1988).

The use of focus groups began as a result of frustration with polling methods such as the survey and questionnaires. Social science and especially psychology have a long history of implementing group therapy which is essentially the basic framework from which the focus group method is derived (Bellenger, Barnhardt and Goldstucker, 1976).

In order to collect data that would reflect perceptions, ideas, opinions, concerns, thoughts and attitudes related to personal experiences of an aging population in grocery shopping environments, the focus group method of data collection was the best research tool to use (Krueger, 1994; Merton, 1989; Morgan, 1993; Stewart and Shamdasani, 1990). Essentially a group interview, this tool promoted small group discussion regarding how each individual responds to or adapts to the grocery store environment (Goldman, 1962).

Familiar membership and socially oriented small group focus discussions are perceived to
be less threatening and promote informal discussion more freely (Krueger and Casey, 2000).

A familiar type of setting potentially increases the number of participants who would be comfortable sharing their thoughts (Peters, 1993; Vaughn, Schumm and Sinagub, 1996). Group discussion and interaction between group members can provide further insight and have the opportunity to reveal perceptions that may not otherwise be recognized by simply collecting data through survey questions (Krueger and Casey, 2000). This was confirmed through participants’ differing perspectives and views. All dissenting opinions were respectfully appreciated by other members and no major disagreements occurred.

Guided discussion by a moderator helped to keep the discussion on task and allowed a deeper understanding of existing personal abilities and challenges with particular design features encountered in the grocery store environment. Groups discussed development of potential alternative solutions or design strategies for the redesign of specific design features within the grocery store setting that would support independent functioning.

This qualitative data also serve to validate or negate the student researcher’s observational interpretations, assumptions or predictions related to changing needs of elderly participants in these public spaces (Onwueguzie, Dickinson, Leech and Zoran, 2009). This is particularly true because the target audience differs from the student researcher in age, physical ability and experience and in this case generational attitudes may influence data results. Conducting a series of focus groups has confirmed that expressed ideas and notions are shared more widely by the local elderly community.
Research Procedures

In an effort to seek out a local population that is 65 years of age or older, communities that are considered to be retirement communities within the city limits of a small college town were included in the target population. These communities all had a central manager or board of directors who took care of all day-to-day operations and activity offerings. Upon understanding the intentions of this study, these individuals at four sites did agree to recruit participants for this study. Two focus group discussions were held at each site with the exception of one where three were held based on interested participants’ schedule conflicts.

The common means by which participants were contacted and recruited was by a monthly newsletter or by bulletin board flyer placement. Particular dates and times for focus group discussions were agreed upon and posted in the newsletters on bulletin boards in public areas on the premises. Activity directors verbally reminded participant candidates of upcoming meetings and in one case a continually scrolling message on a campus television channel was made possible.

At each focus group discussion, the participants were given a detailed description handout of the study at the time of the meeting. Signed consent forms were obtained from volunteer participants. Participant signature sheets were retained by the student researcher and the remaining consent form information was given to each participant in the event that any future questions or comments happened to arise.
Data analysis

After each focus group discussion had taken place, notes from the student researcher and an assistant note taker were combined. The note takers were not the same each time, nor were they trained design professionals. This assistance was based on voluntary random availability. An audio tape recording was made during each focus group discussion. Audio tape based analysis and combined notes produced an abridged transcript of each discussion. Researcher notes were reviewed and compared to the taped discussion following each discussion group to ensure all issues of interest and points of concern had been covered and documented. Tapes were then erased. During the data collection process, developing the abridged transcripts helped maintain the focus on participant questions and supporting details. Likewise, they prevented becoming distracted by information unrelated to the subject matter such as price of goods, item packaging, hours of operation, advertising and much more (Onwuegbuzie et al., 2009). As an additional benefit, reviewing transcripts prior to conducting a new focus group discussion refreshed the content knowledge from previous discussions for the researcher. Notes did not record any names or gender of participants who did share thoughts regarding their experiences during grocery shopping and any suggestions they may have had for improving this space.

Although social science researchers have been implementing the use of focus groups since the 1920s (Morgan, 1998), there is no current framework to define qualitative analysis techniques for the focus group method of data collection (Onwuegbuzie et al., 2009). For the purposes of this study, constant comparisons of responses are noted to identify frequently stated common inputs not only within a group discussion but also
between group discussions. This allows recognition of categories that eventually reveal common themes. In more recent years, this method of analysis has been referred to as emergent-systematic focus group design analysis because it makes allows for natural exploration of an issue for the purpose of verifying or refuting a researchers’ previously formed impressions (Onwuegbuzie et al., 2009).

The most common manner of analysis for focus group data is to categorize the information in an effort to discover similarities or themes (Morgan, 1997). Data was evaluated according to categories developed through the observation tool. Content analysis was the method of choice to consider which design features within the grocery store were adequate and which could benefit from redesign. By categorizing these data all comments noted by all participants are given consideration, not just the recognized features that seem to occur more frequently. This ensures the researcher has a more comprehensive picture than what previous impressions were in the development stages of the focus group discussion intentions (Morgan, 1997). Some participant input may not fit entirely into a category. Each group made some suggestions that they thought might improve the ease of use of the space. Groups discussed some ideas based on the observation phase by the student researcher.

**Limitations of the study**

A wide age range was considered for inclusion and is likely to have generational influences. Attitudes reflecting need for changes versus desired convenience were verbalized a few times; direct and indirect costs of design feature changes upon the cost of
grocery items were always a concern.

The conclusions and recommendations for implementing changes in design features are based on the impressions of the participants of the focus group discussions. Some participants may have answered differently if more time and thought had been given to design change considerations.

Some participants stated they were intimidated by the use of technology in a grocery store setting and that they would not likely use design feature changes based on technology. Full evaluation of technological considerations may prove different if a prototype pilot test option could be implemented.

**Validity and reliability**

Qualitative research seeks to understand, recognize or explore phenomena or events that occur as a result of non-statistical means rather than quantifiable means; the data unfolds in a natural or context-specific setting (Golafshani, 2003). The data are subject to change between contextual settings, researchers and geographical locations, and is therefore interpretive data. Johnson (1997) conducted a review of the literature evaluating the concept of validity and reliability for qualitative research. According to his results, there are mixed reactions as to whether or not it is appropriate to test validity and reliability in “interpretive” research. Relevant literature suggests that perhaps a more appropriate means of evaluating interpretive research would be to consider the credibility of the researcher(s) to evaluate the quality of the data without bias influence (Stenbacka, 2001). Johnson (1997) states that, “A common complaint regarding qualitative research is that
data can be interpreted to say whatever the researcher wants it to say”. Patton (2002) suggests that the “trustworthiness” of interpretation can be evaluated according to how well the data can be generally applied to a wider sample of participants, especially if different researchers use the same methods. There needs to be a conscious awareness of truthful interpretation of the data throughout the design of the study, obtaining data, analyzing data and assigning meaning to the data while at the same time being aware of the potential for personal bias (Patton, 2002). Johnson (1997) suggests working in a team provides a system of checks and balances using reflexivity and negative case sampling. He explains reflection actively engages the researcher in an effort to evaluate data based on the researchers personal experiences versus allowing the data to reveal its own unique meaning. Negative case sampling is the purposeful selection of data examples that disconfirm expectations or explanations (Johnson, 1997) and can help clarify meaning of data without bias. These are useful strategies because there is researcher awareness to specifically consider personal bias during the evaluation and interpretation of data. These techniques force the researcher to consider alternative perspectives prior to assigning meaning to the data.

The terms valid and reliable imply that something can be trusted, that data results are believable or defensible and that the interpretation of data is accurate. The best way to validate qualitative data is to triangulate data collection methods but it is not always necessary to do so. This study considered use of multiple methods through observation, group interviews and audio recordings. Validity and reliability were mainly considered in regard to whether the methods could be repeated and if the results could be generalized.
To protect against researcher bias, the methods of data collection were to first be evaluated as to whether or not they were suitable for the purposes of the study. While impressions may have been formed during the initial observation stages, no solid conclusions, beliefs or opinions were formed. Consideration as to whether the interpretations of the observation seemed logical is referred to as face validity (Chatman, 1992). The observations served as a means to develop a framework for discussion within each focus group. The researcher asked the questions but all data were participant reported. By conducting a series of focus groups to compare and contrast data, relevant themes were allowed to surface as well as unique concerns. The framework of the focus group can be evaluated upon consideration of the data results as compared to initial observational impressions; this can evaluate the scope and depth of desired data to be collected (Chatman, 1992). This study considered whether or not the observational based focus group framework was comprehensive or whether or not the majority of discussions were more concerned with topics not contained within the framework.

The use of a convenience sample could potentially result in bias (Johnson, 1997) if the sample was purposefully chosen as a result of a particular characteristic such as gender, cultural background or education level. This study did not use personal character limits on the participant sample. Rather participants were recruited based on daily living capabilities such as living independently, preparing meals and shopping for groceries at least twice a week.

The question regarding external validity can be raised with consideration of participants and the setting in which the data were collected. The nature of recruitment was voluntary
and the settings were chosen according to familiarity of the participants. Each focus group discussion consisted of members who were similar to the intended group for which any generalization can be made (Johnson, 1997; Stake, 1990). This study postulates that there are emerging design feature changes needed in the grocery store setting based on biological changes of the aging process. Stake (1990) refers to this as naturalistic generalization: a situation that involves similar people in a similar setting, not dependent upon any geographical location. Naturalistic generalization is defensible across a larger group of people. Cook and Campbell (1979) suggest when a research study can be said to have naturalistic generalizability, then replication logic will likely prove that the more times the study is conducted and the findings are consistent then the more credible the study becomes. According to Adler and Adler (1984), if data results appear to be consistent across different participants and settings then the study is considered to be externally valid.
Chapter Four: Data results and discussion

Each focus group discussion took place in the common space of the residential communities at the four sites that agreed to participate. Every discussion was begun and guided by the same previously developed script of questions and probes. Not every discussion identified all of the same design features that presented the participants with challenges or those design features recognized as supporting independent activity. It should also be noted that not every participant within any one focus group agreed fully about what posed a challenge and what did not pose a challenge. However, given the rather benign discussion content no significant dissent was of note. While there were some common themes that became apparent, there were also some design features that seemed to be specific to only one or two discussions.

Basic categories emerged during the observation phase and served as the basis for the question topics included in the focus group discussion framework. Two additional categories were added as a result of the discussions: miscellaneous and technology. The data first begin with a brief overview of responses to opening questions, introductory questions, transitions questions and then key focus questions.

The following report is organized according to the categories that were recognized during the observation phase and also used for developing the framework for the focus group discussions. Each category is presented as shared comments followed by special issues/perceptions within the category. The majority of data reported reveals common challenges that were discussed in nearly every focus group discussion.
**Opening question responses**

All of the participants had lived at the designated sites for at least five years. While some did continue to drive, they frequently shopped with a friend or relative, or rode the resident facility bus or the local community bus system to the grocery store.

Generally grocery shopping was viewed as good exercise and a social opportunity that fortunately happened to fulfill an independent activity of daily needs. One focus group unanimously perceived grocery shopping as a chore. Most participants, though not all, said they did enjoy cooking and baking but that doing so was a challenge mostly because packaging did not support cooking for one or two. This issue significantly influences what they buy and their menu choices.

**Introductory question responses**

When participants were asked to consider differences between shopping now and over past years, they all responded with the recent mobility challenges as their first answer. Other responses related to normal aging changes such as optical deterioration, decline in stamina and muscle strength and decline in height stature. Declines in auditory senses were notable when requesting assistance from others; it was often difficult to understand what was being stated by the other person. As will be discussed in the body of this chapter, these changes do influence the ability to optimally use current design features but participants also remarked they have learned to adapt their abilities to their physical changes and report they can “manage” the grocery store environment. Other notable challenges included the
overwhelming assortment of choices available for product merchandise, height of fixture
displays and the ever-growing size of grocery stores.

Transition questions responses

Within the city limits, seven different grocery stores were discussed for the sake of
comparisons and example. Each store appeared to have some features that were desirable
and some features that the participants believed could be improved. No one store will
be identified by this study but it should be especially noted that a preferred option is that
individual store layout be consistent within any one grocery store chain. This consistent
layout within a chain means merchandise placement is identical; the shopping environment
is more easily managed due to habitual experience.

Key question responses

Entrances and exits: Shared comments

The discussion always began with consideration of the entrances/exits of the grocery
store. As long as doors were automated they were not perceived to be of any particular
challenge. However upon comparison, doors that opened in a sliding pocket operation were
preferred to the standard swing operation simply because swing doors were perceived as
obstacles that impinged upon mobility. Double door passage that is between 8- 10 feet
wide was preferred to single door passage. Upon store entry, participants recommended
handrails be available for a distance of 3- 4 feet to assist with stabilization when
transitioning between the inside and outside.

Nearly all participants stated there should be a minimum of two and optimally four entrances/exits for any one store. Multiple access points allow the customer to choose where they want to begin shopping rather than have a designated “suggested” pathway for shopping, many preferred to shop produce last rather than first.

Placing an entrance apart from an exit did pose some parking concerns especially with inclement weather. Bumping into one another when an entrance and exit were shared was stated as an annoyance, but if doors were placed near one another and designated as separate entrance or exit, the general consensus was that this configuration worked better. Many felt that having entrances/exits available on more than one side of the building would allow more handicap parking options and support easier access into the grocery store.

The majority did agree that designing a foyer style entrance with exterior and interior doors, an area for cart storage, and a designated seating/waiting area would be useful. This would provide quick access to carts to assist with stability or balance challenges prior to store entry and a protected area with full window views to wait safely for a ride.

**Entrances and exits: Special issues/perceptions**

One focus group expressed a desire for exterior roof overhangs of 4 or 6 feet at all access points. They felt this helped to decrease their exposure to weather - rain, snow, wind and extreme sun. This group also preferred the cart corrals have some roofing available to protect them from moisture and heat.

One focus group believed there was routinely too much “stuff” available in
entrance/exit areas. For example, they felt that the vending machines, movie machines, magazine racks and shopping carts presented too much clutter and should be placed further off to a side. They would prefer a clean spacious entry with carts off to a side so they did not impinge upon the basic pathway into the store.

Two focus groups were especially concerned with clutter at the doorways. They preferred that no storage or displays such as vending machines were placed in the foyer area. These groups preferred carts be stored inside the foyer area and dried off prior to customer use.

Another focus group expressed a desire to observe information upon entering the store for weekly sales. Discussion of this idea began with the suggestion of a bulletin board and arrived at the idea of a mounted television with a store channel that offered sale information, perhaps information on access to store managers and when to expect a particular food to come in season.

**Access points from the parking lot to grocery store: Shared comments**

In half of the focus group discussions, participants verbalized concerns for maintaining their balance when walking to and from their cars. Those who used walkers especially verbalized a desire for a solution to this problem. The parking lot was not initially within the intended scope of this study but it quickly became apparent that this aspect of the grocery store environment is of particular interest of the participants and does influence interior design features such as number of access points and layout. Every group shared a great concern regarding the lack of available close parking and that the weather frequently posed
concerns in the parking lot. A secondary concern arose with cart corral storage outdoors; it was located too far away from handicap parking spaces. A potential alternative solution was for some covered handicap parking spaces that would allow cart placement next to each parking space. Other common frustrations voiced were regarding people parking in handicap spaces that had no need to use the space. They believe efforts to enforce parking laws are too relaxed. Discussion at each focus group involved some type of covered parking that could be monitored. Perhaps the best solution involves an attendant that monitors entrance to covered, close parking based on year of birth and ability. Another possibility is to issue a permit or pass card at no charge that would operate by camera scanning similar to the Federal Highway Commissions Interstate pass. In such a layout cart corral storage could be made available near each car.

Transporting goods to the parking lot remains a challenge. Participants preferred that a store employee assist them to their vehicle and help load items into the vehicle. While everyone was aware of automobile grocery pick-up lanes, not many of them used this option because they liked to use the carts for stability when returning to their vehicle. Participants did comment about cart corral storage being too far away from handicap parking.

Access points from the parking lot to grocery store: Special issues/perceptions

One focus group said they would look for a parking space that had a cart left there by the prior occupant so that they could use it for support to enter the store. They would like to have cart storage next to the handicap parking space. They also commented that when they
did park in handicap parking and did use their personal walking device for assistance to enter the store, they were faced with the challenge of managing both the cart and the assistive device. They would prefer to have available a place to safely store their walking devices while shopping and pick them back up again when they have finished.

One focus group posed an idea to bring your walker or cane into the store and check it in exchange for a cart at a service area similar to a coat check. Personal items, such as coats, umbrellas, canes and walkers would be kept safe while you did your shopping and picked up gain before leaving the building. They all thought this might encourage them to then use the drive through pickup service to get their groceries.

**Carts: Shared comments**

About 1/3 of the participants preferred to use the battery-operated scooter carts to do their shopping but stated that these carts frequently would be left unplugged and either not be charged or would run out of power half way through their shopping. Maneuvering capabilities require more space to use these, however, and it was noted that driving this cart did require some skill. The remaining 2/3 of the participants preferred to use shopping carts as opposed to baskets even if they only needed to purchase a couple items. This is due to having available support for stability during shopping.

Cart design preferences did vary somewhat. The average size of a grocery shopping cart in the study area is 2 feet by 3 feet and 18” deep. A few participants stated they liked a shallow cart design that is approximately 1 foot deep by 2 feet by 3 feet and some liked the smaller cart design that is roughly 2 feet square by 1 foot deep. Other cart preferences were
discussed as well but will be discussed in the technology section. A common frustration among participants is that carts are frequently jammed together making it difficult to get a cart. Those who do experience challenges with balance and declining muscle strength sometimes cannot obtain a cart without help from either another customer or a store employee. Most believed that carts at airports where much easier to obtain but did not like the idea of paying to obtain a cart. The majority of participants would like to try this type of cart and rail system in the grocery setting to avoid jammed carts.

![Image of shopping carts](image)

**Figure 3.** The above images are examples of shopping carts. Shown is a motorized riding cart, a typical push cart and a smaller, more shallow push cart. Photographic illustrations are referenced at the end of the paper.

**Carts: Special issues/perceptions**

Three focus groups preferred indoor cart storage that is set away from the path of traffic flow. They also expressed concern about carts not being kept dry from weather elements and not sanitizing carts between customers. These three groups were greatly concerned about cart sanitation and felt that disposable disinfectant wipes should be made available by the store.

One focus group said that they would prefer some way to contain a personal cane on the cart rather than having to place it inside the cart because a cane frequently slips through
cart holes or is easily knocked off the cart if it is hung on the side.

There have been some new developments in cart design that incorporate automatic bagging and technology. These design options were discussed and will be addressed in the section on technology.

**Aisles: Shared comments**

Within the seven stores that were discussed for comparison and to help emphasize examples, there are eight different aisle widths used within the store layouts; ranging from 5 feet to 10 feet wide. The question was posed as to what the optimal aisle width might be. There were varied responses that were consistent between all focus group discussions. The formulas worked like this:

- the width of a scooter cart + the width of a standard cart + 2 feet (it was felt that since the scooter is perceived to be wider than the standard cart this option would allow easy passage for the scooter and a standard shopping cart as well as someone trying to walk through the aisle)

- the width of three standard shopping carts (this was perceived to allow easy passage for traffic to flow without interruption)

- the width of two scooter carts + two feet (this was perceived to meet the needs of traffic flow for most cart configurations)

The following illustrations are examples of typical grocery store floor plans, though they are not the plans for the local grocery stores discussed in the focus groups. These plans appear to be very well organized and clearly designate departments but it is the
experience of the participants that aisle widths are not evenly spaced as they are in these illustrations. These plans do point out typical use of long shelving displays which was a concern discussed by every focus group.

Figure 4. Photographic illustration of a traditional grocery store schematic floor plan. Photographic illustrations are referenced at the end of the paper.

Figure 5. Photographic illustration of a typical modernized grocery store schematic floor plan. Photographic illustrations are referenced at the end of the paper.
Store aisle lengths and layouts vary as well. Pushing a cart down a long aisle tends to promote fatigue both physically and psychologically. All participants agreed that splitting the aisles up into at least two and preferably three sections with cross walk aisles was the better option.

The above illustration portrays photographic illustration 4 with the aisles divided into sets of three to allow the perception of the aisles being shorter. This scheme also creates more end caps that can accommodate the computer kiosks discussed in the technology section and aisle seating options. Below is an example of a schematic plan that portrays traditional grocery store floor plans which have not had consistent aisle widths; consistent aisle widths were stated to be a preference by the focus group participants.
Other preferences included:

- maintaining aisle widths throughout the store; this promotes consistency
- providing aisle indicators for different sections to help with wayfinding (e.g. aisle 2A/B, 2 C/D, 2 E/G where the alphabet icon refers to the left or right side of that numbered aisle)

Figure 7. Diagrammatic view of traditional aisle layouts. Original schematic by S. Steenblock
Figure 8. Diagrammatic view of revised modern aisles. Original schematic by S. Steenblock

- provide seating at different heights within each aisle that could accommodate at least two people (This affords a place to rest before proceeding, or to sit and chat upon meeting a friend. Multi level seating more easily meets the needs of different sized individuals.)

- choosing aisle seating that is firm and sturdy and has an open area beneath legs to allow foot placement and arms that support weight (these features help patrons rise to standing position)
Participants stated that maneuvering aisles did not seem to be a problem as long as additional merchandise displays were kept to either the front or rear edges of the store and not placed within aisles.

**Aisles: Special issues/perceptions**

One focus group believed that if aisle seating were available they would also like to see some mechanism that would assist with standing back up - similar to the universal design seat inserts that allow for spring loaded lifting assistance.

Figure 10. The above images are portable versions of lift assist devices to place on a chair. Preferable options would be for this type of device to be built into the seating options placed within the aisle seating. Photographic illustrations are referenced at the end of the paper.
**Flooring: Shared comments**

No concerns were expressed regarding flooring materials. It was noted however that during months when there was heavy precipitation, placement of rubber backed carpet mats were appreciated to help dry off footwear prior to shopping. Placing area mats on top of solid flooring contributes to tripping hazards and this was noted to be a concern at the entrance/exit access points as they seem to shift and buckle with heavy foot traffic.

**Flooring: Special issues/perceptions**

Of special note, one focus group preferred the rubber back carpet mats be placed in the produce aisles because of the spray mist used to keep produce fresh.

Another focus group thought that installing metal floor grates with some continuous air flow might work better to dry off shoes and remove dirt before shopping.

![Image](image.png)

**Figure 11.** The above photographic images are examples of rubber floor mats placed near the entry/exit, placed along the pathway in the produce department and a view of the detail of the continuous airflow system that is useful to dry shoes and catch dirt. Photographic illustrations are referenced at the end of the paper.

A recent development in non-slip flooring for public spaces that is designed to help remove dirt and moisture from footwear prior to entering a space is a product called flooromtery™. It is available either as metal floor grates or as small rubber tiles. Small cracks between tiles or floor grates allow debris to fall into a collection space below that can be easily cleaned.
Figure 12. The above photographic illustrations are non-slip floorometry."™
The left image is the metal grate option, the middle image is the rubber tile option and the far right image reveals the collection pan and the cracks between tiles that allow for debris collection.

**Shelving: Shared comments**

All participants agreed that shelving reach was a consistent physical challenge. There was approximately a 50/50 split in regards to physical challenges with reach between the upper shelving and the lower shelving. Most participants reported they adapt to this challenge by seeking out store employees or other customers to help them obtain the items they want. About 1/3 reported that they actually get down on their knees to get items from the bottom shelf and then spend several minutes trying to pull themselves up using the shelving fixtures and cart for support. These same individuals also frequently reported climbing onto lower shelving to help them reach items on upper shelves. Which often resulted in them losing grip of the item and occasionally being hit by it before it ended up on the floor.

As one might guess, many of these individuals did admit that they have some issues with asking for help. They stated they just could not allow themselves to depend on someone else to get their grocery shopping tasks completed. Many also commented that there did not seem to be enough employees available when they did choose to ask for help. The remaining 2/3 of the participants felt that most people are happy to help, but in an ideal
world they would be able to reach all items by themselves. They recognized that reach limitations are a fact of the aging body and understand that they need to make adaptations to accomplish their tasks now.

All participants liked the existing drop-down system used in many stores for soups and similar canned goods, but results were mixed for the spring loaded shelf addition that could push items forward. They did agree that in some situations graduated shelving might help in situations such as lifting bags of flour straight up rather than out and up from the bottom shelf. Other suggestions were to design mechanically assisted pull-down/push up shelving similar to accessible handicap cabinetry, where upper shelves can pull down and lower shelving can pull up. Alternative solutions for shelving were discussed and will be addressed in the section on technology.

About half of the participants agreed that on occasion the shelving depth made it difficult to see items. In some instances when a particular item was at the back of the shelf, it was darker and made it difficult to identify. Installing a lighted background to the shelving offering more illumination might help in locating items placed deeper on the shelves. Those who did not like this idea thought it might produce shadows and preferred the idea of concealed under shelf lighting that could better direct light onto the merchandise. Discussion regarding maintenance concerns for extra lighting resulted in the suggested use of LED lighting for the under shelving systems.
Figure 13. The above images are examples under shelf lighting. The shelves have edges that conceal the rope style LED lighting. Photographic illustrations are referenced at the end of the paper.

Stooping, climbing, kneeling and pulling up to standing are active body motions and present physical challenge to individuals who may already be experiencing declines in balance, muscle strength and stamina. Alternative solutions for shelving concerns were discussed and will be addressed in the section on technology.

**Shelving: Special issues/perceptions**

Those who had more concerns with reaching items on lower shelves believed graduated shelving might help by changing the body mechanics from having to pull out and up to just pulling up to the cart. Two focus groups stated a preference for bins and scoops in dry goods such as rice, cereal and spices. This could allow customers to purchase only what they need and prevent waste.

Figure 14. Photographic illustration of examples of graduated shelving. Photographic illustrations are referenced at the end of the paper.
Pricing information labels: Shared comments

Signage for special pricing on items is frequently placed on shelving with small clips; experience has proved they frequently accidentally fall off and are easily moved. An ability to read pricing information labels placed on the shelves was a consistent concern for all participants. The font was perceived to be too small and did not indicate sale items, nutritional value or expiration dates. This concern is further addressed in the section on technology.

The local grocery store options differ vastly in the amount of space allotted to merchandise. The amount of effort required to understand the layout and successfully navigate wayfinding therefore is also considerably different. The majority of participants
prefer a small grocery store environment because of its scale and ease of use. Many have shopped at the same store for 30 years and are familiar with the layout and location of items. They report that the manager does not move merchandise around like other grocery stores. The perception is that the user doesn’t need to expend effort and time to read signage because the item locations are familiar. A major concern of all participants was that they feel like store layouts forced them to “wander” to locate desired items. They perceived that store merchandise is constantly being moved around and relocated; sometimes even placing the same item in multiple locations. These concerns frustrated them greatly. About half of the participants reported that they find large grocery stores confusing, intimidating and difficult to use items because they don’t really know where to begin to look. There were no special issues/perceptions noted.

**Wayfinding signage: Shared comments**

Wayfinding signage traditionally is placed above each aisle and the font varies from seriffed to sans serif. The color of the font varies but is generally either black or white on a high contrast background such as yellow, dark green, red, dark blue, white or black. Research reveals that the best option for an aging eye to more clearly read signage is to use white san serif typeface on a dark background (Mahnke, 1987) or to use black typeface on a bright yellow background. Research suggests that due to a decreasing sensitivity to contrast in the aging eye many colors appear gray. Yellow however is usually perceived accurately because it falls in the middle of the light wavelength spectrum (O’Connor and Davis, 2005). The question for color preference on signage was discussed by the focus group participants. Interestingly, most of them said they really never paid close attention but they would
probably prefer bold black san serif typeface on a white background, perhaps because that was what they were used to reading in books and newspapers. After some thought however, about 1/3 of them did suggest that they would like white san serif typeface on a dark background (blue in most of these cases) if the signage could be lit up in such a way that the lettering could stand out more, perhaps a gentle glow. Participants could not offer an explanation for preferences other than in the case of black on white due to what they were used to reading in other aspects of their life. Note the following examples.

![Figure 17](image_url)  

Figure 17. Image reveals the yellow center of the light spectrum and exhibits two examples of sign color combinations; the other option considered in discussions was the black on white similar to this text. Photographic illustrations are referenced at the end of the paper.

It was also noted that signage should be double sided. Typically a sign is placed at each end of the store to be read from the outside pathway along the store perimeter. Sometimes the signs are not double sided and that can add to frustration with locating items.

Individuals who reported some macular degeneration (about ¼ of them) said that reading signage above the aisles was not possible. All participants did believe that repeating
the same signage information near the end cap in the aisles would be helpful if it were placed just below eyelevel so that those of shorter stature and those in wheelchairs or motorized carts could read them as well. They did not believe these would need to be lighted or should replace the existing overhead aisle signage. There were no special issues/perceptions noted.

**Wayfinding for item location: Shared comments**

Wayfinding was a consistent concern for the participants. One focus group reported that one local store does supply paper maps to help shoppers locate items and while helpful, the maps were frequently not available. All participants stated they would like some type of system available to locate items and the discussion revealed some interesting ideas. Many members of this target population are used to asking for help but they have indicated that it is not always easy to find a store employee to ask. They all disliked the practice of relocating items but accept that nearly every grocery store does this routinely. As a result, even employees are often not sure where these relocated items have been placed. Participants would like to have small desks or kiosks with an employee available to operate a small computer to locate their item of interest quickly. Keeping current item locations on a computer program would facilitate locating an item at any time. These kiosks would optimally be placed about every 4th to 6th aisle near an end cap. Other alternative solutions were considered and will be discussed in the section on technology. There were no special issues/perceptions noted.
Produce department challenges: Shared comments

Some departments within grocery stores have special challenges not seen elsewhere in the store. A few of these departments are the fresh produce, freezer and meat departments. The fresh produce department presents challenges in maintaining fresh food. Sometimes fresh produce sits too long. On occasion it doesn’t smell very appetizing or have great eye appeal. The general height and depth of the produce displays seem adequate for most of the participants but the manner by which the merchandise is supplied or displayed can present challenges. For example, citrus fruit is frequently piled on a slanted surface with only a small lip at the lower edge of the table to stabilize the whole display. If one happens to pull out a piece of fruit from a central or lower location the whole display can become unstable. Piling fresh produce in this manner also promotes bruising of the items. The focus group discussions indicated that they would prefer a stepped display system that could allow for examination of the produce prior to purchase. While less produce would likely be displayed at any one time, it would likely be fresher and easier to examine. Produce bag dispensers need to be lowered to hip level or table top level for universal access.
**Produce department challenges: Special issues/perceptions**

Regarding the produce section, one focus group made an observation and posed their own solution. In an effort to keep fresh produce fresh, many grocery stores install a mist or sprayer system for the hutch style fixtures that stack produce. Frequently, while reaching for items the sprayer comes on and hands can get wet. This group suggested disposable towelettes be made available not only to dry hands, but to dry the produce as well because putting wet food in the refrigerator leads to quicker spoilage.

Some focus group members thought the produce displays were too tall and too deep because they had problems reaching the best fruit near the top of the display. A few focus groups pointed out that they did not like having to shop for produce first as is dictated by standard grocery store layout because other items would get placed upon the fresh produce inside the cart. They felt that produce should be placed just before the checkout area so delicate fruits and vegetables stay on top of the other selected items in their carts.

**Frozen foods department challenges: Shared comments**

The freezer department has at least three different display options. The first is a bin style freezer that is left open on top, the second is this same bin style but with an added open shelved system that appears to look much like a desk hutch and the third option is an upright shelved freezer with full length glass doors. The majority of the participants said they didn’t really object to any of these except that they would like to see sliding doors on top of the bins and sliding doors across the hutch areas as well. When digging through bin style freezers to find a particular item, they find that items at the bottom are always more
frozen. When these types of fixtures were used without doors, participants were concerned about how well preserved items would be. Additionally, they expressed concern regarding wasted energy. The preferred freezer method was the shelved glass door option however they believed replacing the hinged doors with sliding doors would be a much better design for ease of use and would take up less space within the aisles.

Hutch style with sliding glass doors  Upright style with swing glass doors  Bin style with sliding glass doors on top

Figure 19. The above images are examples of freezer style options available at most grocery stores. These are modified to include doors; frequently the only style to include doors is the upright version. Photographic illustrations are referenced at the end of the paper.

**Frozen foods department challenges: Special issues/perceptions**

There is a concern for energy efficiency regarding the refrigerated and freezer departments. It was considered at six focus group discussions as to whether or not placing a wall between the general merchandise and the cold items would better contain temperatures, resulting in decreasing energy costs. Of these six groups only one had participants that thought this would be a good idea; the others felt that having to pass through a door, even an automated would be perceived psychologically as a barrier. Colder temperatures in freezer and meat departments cannot be avoided but perhaps it is not the most cost or energy efficient layout for the entire store to be open and not contain temperatures better. The other groups didn’t like having to pass through more doors which
they perceived would make things feel more crowded.

**Fresh meat department challenges: Shared comments**

The meat department traditionally has a glass display case to showcase fresh cut meat. The butcher can access the cuts from the back side of the case to custom package for each customer. Generally the height of these cases is 4 to 4.5 feet high and for some individuals, reaching up over the top of the case to obtain their purchase is a challenge. To solve this problem a lower countertop close to the end of the meat display case could serve as a pick-up area. Participants said they would prefer to have at least two lower counters and maybe even three that could separate beef, chicken and seafood. All participants expressed concern for sanitation when it came to fresh cut meat and cheese (raw or deli style). They want to be able to fully witness the butcher’s workspace and would prefer to examine cuts of meat prior to purchase, would like to request fresh cuts of meat while they wait. About half requested seating be made available near the meat counter as well. Seating should be firm and sturdy with arms and an open area beneath the seat to place feet; these features assist with pushing up from a seated position to standing.

![Figure 20](image.png)

**Figure 20.** The above image is an example of a typical fresh meat display case (height ranges between 4 and 4.5 feet high). Placement of lower countertops at both ends is preferred. Photographic illustrations are referenced at the end of the paper.
**Fresh meat department challenges: Special issues/perceptions**

These concerns were expressed in the previous discussion regarding frozen food challenges. Participants believed the same concerns for temperature control applied to both departments.

**Alternative services: Shared comments**

The more recent trend in grocery store design has been to house alternative services in addition to grocery services. Most of the participants appreciate the convenience of easy access to banking, pharmacy, post office, dry cleaning and floral. However they did feel that these services could be more contained so as to not require the customer to travel through these areas. In other words, they think that placing theses services along a perimeter that does not cross a general pathway would be better. It was also noted that the pharmacy should be located near a door and optimally offer drive up and delivery. Some privacy concerns existed for the banking option; banking should be available but designed to provide maximum privacy.

**Alternative services: Special issues/perceptions**

One focus group said they did not routinely use the alternative services available in the grocery store however they did not mind having extra services available to others as long as the services were clearly set apart from the grocery merchandise. One member of this group also said that she was aware that fruit produces ethylene gases which can promote wilting in flowers. For this reason and because many individuals have allergies and sensitivities to flowers and other plant materials, group members suggested that floral
departments be more contained.

Two focus groups did not like having extra services available because they visited the grocery store strictly to obtain groceries; privacy concerns related to some services such as banking and pharmacy were cited.

Figure 21. The above images are examples of floral displays within grocery stores. Frequently patrons are required to walk around these displays. Photographic illustrations are referenced at the end of the paper.

Dining opportunities: Shared comments

All participants agreed that additional services, though not used by all, were beneficial. Specifically these included a delicatessen, a coffee shop and a café. All participants appreciated being able to purchase a fully cooked dinner once in awhile and to be able to order a cup of coffee anytime during the day. An option to stay and eat or drink offered pleasant social opportunities and provided a meeting place. There were no special issues/perceptions noted.

Special dietary needs: Shared comments

Older adults are at risk for malnutrition (Aldwin et al., 2006; Brownie, 2006) for many reasons. Affordability of food and the practice of packaging in large amounts means that food often spoils before it is used completely. This latter reason means they do not get the best value for their money because they over purchase for their needs. Therefore they do
not always have a choice to purchase the healthiest options. This was a common concern in every focus group meeting.

Two local grocery stores offer an on-site dietician. However none of the participants have made use of these services because they did not know how to do so. Frequent nutrition screenings and diet assessment could help prevent or minimize malnutrition in aging (Hickman, 2006). About 2/3 of the participants stated they would ask diet and nutrition questions of a registered dietician if this person were easily accessible to them while they shopped. They would prefer a desk or kiosk in the produce department where this service could be easily accessed during daytime shopping hours. Another question related to the dietician services was whether or not they would participate in cooking lessons or watch demonstrations in a test kitchen. About half said they would like to do so because it would help them learn new recipes for better nutrition and might also offer a social outlet. They also liked the idea of being able to taste samples for new recipes before trying to cook something for themselves.

Special dietary needs: Special issues/perceptions

One focus group said they would use the dietary information if they needed advice about cooking for visitors who had special diet needs such as diabetes or allergies. They considered themselves in very good health and did not perceive a need for personal nutrition counseling.

Another focus group said they would not likely use dietician services because they believed concentrating purchase habits on fresh diet. They did think a test kitchen idea for
obtaining new recipes and specific nutritional information would be useful.

Figure 22. These images are examples of what could be used for a dietary consult kiosk and a test kitchen that could be utilized in a number of ways. Photographic illustrations are referenced at the end of the paper.

**Restroom: Shared comments**

Restrooms are commonly difficult to locate in public spaces and grocery stores are no exception. About half of the participants did not know where the restrooms were located in these local grocery stores. Those who did reported significant challenges in navigation. Some challenges included doors that open the wrong way and were not wide enough, toilets that were too low and access to stalls was too narrow to maneuver a motorized shopping cart. They frequently do not take a walking device along on the motorized cart, posing a problem when leaving the cart to safely use the restroom. When they did find and use the restrooms, they were often not very clean or well supplied.
Restroom: Special issues/perceptions

One particular focus group had several suggestions for restroom improvements. They include wider automated doors at the restroom entry as well as on the handicap stalls. They said they would like to see handicap stalls much larger because frequently handicap shoppers use motorized carts which will not easily maneuver the restrooms or the handicap stalls. They would also appreciate having seat covers always available and hand sanitizer near the door.

Discussion progressed to consider a better restroom layout and two alternatives emerged. The first option makes use of the current idea for the regular public restroom and the family restroom. It was suggested that perhaps the current family restroom could be converted to a handicap restroom that could afford a larger automated doorway and more space for wheelchair or cart turnaround inside. The second option referenced the layouts used in airports. These typically have open side entries that support easy traffic flow. If this could be expanded to be double sided, then one side could be a regular restroom layout and the other could be a handicap restroom with fewer toilets and more maneuvering space.

Checkout: Shared comments

In an effort to cut down on waiting time and help people complete their transactions more quickly, checkout areas have express lanes for customers with fewer items, often 20 or less, regular manned checkout lanes and self-checkout lanes where a customer can scan and bag their own items. Frustration emerged with having to wait in the express line for
customers who exceed the posted maximum of items. Frustration also emerged with self-checkout because fresh produce items required more finger dexterity to look up item sku numbers and weigh the items. They also didn’t appreciate having to bag and cart their own items.

The available maneuvering space for unloading the cart was also believed to be narrow. In most cases the cart is parked near the back side of the checkout belt and the customer then needs to walk around the side of the cart to unload items onto the belt. Often there doesn’t seem to be enough space to walk around the cart. Participants believed that adding just 8” to 12” between each checkout lane would generally improve maneuverability. Some participants thought there should be at least two cart widths of available space here.

The configuration of the checkout counters varies between grocery stores. At some, items are unloaded onto a conveyer belt which moves items closer to the clerk to scan and then placed onto a larger table-like area to be bagged. Payment takes place either in the middle near the clerk or near the end by the bagged groceries. A variation of this system: the clerk unloads the cart onto a conveyer belt after scanning items from the cart; payment remains closest to the beginning by the clerk or near the end by the bagged goods.

Discussion regarding configuration of the conveyer belt at the checkout resulted in a consensus that customer unloading of items before they meet the clerk are preferred to having a clerk unload the items onto the belt that would then accumulate the items further back. They also agreed that the payment activity should be located near the far end of the checkout just prior to leaving the store rather than near the beginning of the conveyer belt.
area. In addition, the shelf available to write a check or hold a purse while they wait was considered too small. They agreed that this was a design feature they would like to keep but see the size increased to at least 10” x 14”.

Figure 23. Diagrammatic view of a standard checkout station used in grocery stores. Notice the preferred design is to allow patrons to unload their own items onto a conveyor belt that will then transport these goods to the clerk. Once items have been scanned they are place in an area behind the clerk waiting to be sacked and the pay table is mounted near the end of the station. Variations of this include stations where the clerk unloads the cart. Photographic illustrations are referenced at the end of the paper.

Checkout: Special issues/perceptions

A few focus groups believed there were never enough open manned checkout lanes at any given time. Most of them did not know how to use the self-checkout lanes and therefore felt using them would not save time.

One focus group in particular desired to see each item on the register screen as it is scanned. They wanted to see the name of the item, weight, cost per unit, sale price versus the regular price and all items as a running total. This is an option in some stores but not all and certainly not to the extent that they would prefer.

One focus group thought that there needed to be more space between the checkout area and the general shopping area because it seemed that they frequently waited in lines.
that curved around the checkouts close to the aisles where traffic would get congested and confusing.

**Overall preferences**

All participants did have personal preferences toward a local grocery store layout but it had more to do with habit, loyalty and brand familiarity than anything else. About half reported that they do find out what sales are offered before they leave home and frequently make several stops to different grocery stores in one afternoon. Value or cost of food items seems to be the most important factor for grocery shopping. Store loyalty was the second reason for choosing the store they most frequently shopped.

Most participants felt that the large grocery store atmospheres do not feel inviting and seem intimidating if they are not familiar with the store. However, customer service can more than make up for the feeling of confusion with wayfinding inside the store. Of particular note was the assistance with obtaining a cart upon entry. They liked the cart storage being out of the way and a service attendant available to bring them a cart when they entered the building.

**Sensory interpretation**

Sensory reaction within the grocery store environment was not something participants had previously paid close attention to unless something was out of the ordinary, such as fresh produce that wasn’t so fresh.

Most did sense that the larger stores did not sound louder than the smaller stores likely due to their decline in auditory function. They did not like the idea of having soft music that
could be heard while shopping because they said that might interfere with their ability to hear special announcements and directions.

Most thought the general ambient lighting was adequate as long as the full diffuser covers were frosted. Use of troffers or louvers were okay but they did feel these options produced a bit more glare if the customer was standing in just the right spot (beneath). Local stores seem to use a combination of direct and indirect light fixtures and glare doesn’t seem to be a concern for these participants. Direct lighting focuses the light down directly onto the merchandise while direct-indirect is focused both down and up toward the ceiling to make use of reflected light. Reflected ceiling light is then used for ambient lighting throughout the store. One focus group remarked that some grocery stores did seem to have shadows between lighting fixtures. This would be easily resolved by placing a few more light fixtures closer together. The majority of the participants preferred to have as much daylight available as possible which would mean installing ceiling skylights.

Figure 24. The above images are examples of commonly observed troffer lighting, louvered lighting and direct-indirect lighting. Photographic illustrations are referenced at the end of the paper.
Miscellaneous

Older people are concerned about sanitation. One focus group voiced concern regarding reduced sanitation through the use of towels or paper towels. They wanted the newer electronic hand dryers that also offered ultraviolet germ-killing mechanisms. This group said they try to avoid using restrooms in the grocery store, but were concerned that if someone did use them and returned to shopping without fully cleaning their hands they could easily cross contaminate merchandise.

Of special note; one focus group did not like the fact that large faced clocks were usually not available. They assumed that this was to encourage wandering in hopes that the customers would buy more. This group would also appreciate public phones available near a waiting area, close to the exit so that they could call for a ride and wait safely inside to watch for that ride.

The location of the redemption center, and the fact that it is attached to the grocery store, bothered one group very much. They considered the cans and bottles to be very dirty and felt that their proximity to food posed a health risk.

Every focus group commented that they would prefer to find milk, butter and eggs near the front of the store. They consider these items staples and would like the option to purchase them on a quick stop without going through the entire store. Efficiency of time and a desire for product value have become core values of for all ages of American society. Therefore, locating staple merchandise near the front of the store is logical and greatly appreciated by all customers (Aylott and Mitchell, 1998; Cohen, 2002; Fishman, 2006).
focus groups expressed the general concern that implementing any new designs may result in an increase in the cost of food. They did not believe they would be comfortable with spending a great deal more money to secure their independent functioning.

**Technology**

Technology has crept into our homes and public spaces over the last 20 years. The first notable technologies used in grocery store settings, recognized by the focus groups were automated doors, digital cash registers and scanning of barcodes. It should not be of great surprise that design feature efforts to enhance independent activity do incorporate technology. Technology can help create environments that are more functional and safer and actually decrease the number of hours a person needs assistance (Hoenig, 2003). Alternative design solutions for previously noted challenges that incorporate the use of technology include shopping carts, product scanners, shelving innovations and positioning systems.

Shopping cart design has been evolving in the past 10 years and as recently as 2009, Klever Marketing (www.klevercart.com), introduced a digital attachment for carts. The “Giving Cart”™ is a rechargeable lithium ion battery operated electronic device that functions as a price checker, a global positioning system (GPS) and much more. It can provide a variety of information about particular items and print store coupons. This particular device might be somewhat complex and intimidating, but perhaps simpler devices could be designed with reduced features. The following images are examples of the “Giving Cart”™ and the charging station for the units that mount onto standard shopping
carts.

Figure 25. Above and below are photographic illustrations of the “Giving Cart”™ by Klever Marketing. Photographic illustrations are referenced at the end of the paper.
In 2002 Springboard Networks in association with Motorola test marketed “Scan It.”™

This device was designed for price checking and automatic purchasing in an effort to bag groceries while shopping and eliminate waiting at checkout lanes.
Another device introduced by Springboard Networks in 2009 is the, “Concierge”™. This device can price scan, provide product information, purchase merchandise and it offers in-store sale advertising, product finder and recipes. It also verifies all the necessary ingredients for selected recipes are in the cart. The “Concierge”™ also suggests which foods typically go well together and even makes wine recommendations (Senne, 2005; www.coolest-gadgets.com, 2009).

![Photographic illustration of the “Concierge”™ shopping cart.](image)

Figure 28. Photographic illustration of the “Concierge”™ shopping cart. Photographic illustrations are referenced at the end of the paper.

Each focus group discussion considered technology for cart usage that could offer options for purchasing while shopping and only about ¼ of all participants thought they would be interested in this option. Their concerns included accidental scanning, purchasing errors and complexity of the technology. However, ¾ of the participants said they would use a price checker and liked the idea of automated product location with a small electronic
device located in aisles or placed on the cart.

There was almost an equal split between individuals who preferred a simple, basic device and those who would like additional features that would provide label information including sodium content, calories per serving, etc.

Most participants did agree that some type of digital positioning system would be helpful, however exactly what this option should look like was not clearly resolved. They did like the idea of a phone receiver, placed within each aisle that when picked up activated a system without a need to dial. Upon lifting the receiver, a red light would flash on the map to show a customer’s location. When a customer asked, “Where are the toothpicks?” then a different colored flashing light (green) would indicate where the item is located. The map would also announce, “Toothpicks are in aisle 2F.” This announcement would also be heard on the phone receiver for those who have more difficulty hearing.

Figure 29. Photographic illustration of an example of a phone information receiver. Photographic illustrations are referenced at the end of the paper.
Participants also liked the option of a digital map (original example figure 19) placed within each aisle that showed their current location with a small green light. If a button was pushed then a question could be asked, for example, “Where can I locate toothpicks?” Once the button was released then the digital map would display the location of the item with a flashing red light and an auditory announcement.

Recently a power strip charger has been developed for charging personal items such as cellular phones and iPods (PowerPad 130™). It looks like a flat surface that items are set down on to be charged. This idea could be utilized for motorized carts as well. A power strip charger could be installed on the floor near cart storage. When the carts were not in use
they could be parked over the power pad and be kept charged all the time.

Figure 31. Above and below are photographic illustrations of the PowerPad™ charger. Photographic illustrations are referenced at the end of the paper.
Revolving shelving devices are not new. Small appliances, jewelry fixtures, closet shelving systems and kitchen and bathroom cabinetry have all integrated different forms of moveable shelving systems. If a shelving system could be designed for grocery store use then a simple push of a button would raise or lower shelving to bring the desired item within easy reach. All participants liked this option.

![Figure 32. Photographic illustration of a rotisserie appliance.](image1)

![Figure 33. Photographic illustration of pull down shelving.](image2)

![Figure 34. Photographic illustration of the “Diago”™ mechanized wall cabinet lift.](image3)

Photographic illustrations are referenced at the end of the paper.
Figure 35. Photographic illustration of the “Diago”™ mechanized wall cabinet lift diagram. Photographic illustrations are referenced at the end of the paper.

About half of the participants stated they are not comfortable using technology but focus group discussions revealed that this discomfort relates to technology that is associated with having to input information. Technology can present in many forms outside of personal computers. Technological ideas that enhance performance for shelving and carts, for example, engendered interest.

**Discussion**

As is evidenced by these results, there continues to be consistently noted challenges within the grocery store environment that do not appear to have been addressed or resolved over the past 30 years. The goal for this study has been to recognize changing
needs and to then encourage actively addressing these needs to promote successful aging and independence. Implementing adaptive design measures to support age imposed limits enhances autonomous performance. Environmental support systems that encourage independence result in bolstered confidence and self-esteem. If a person’s needs are seemingly met then it is more likely that he or she will be satisfied with their surroundings. This was the basic premise for Caroline Hare’s work.

Although an elderly population is not a homogenous one, it is one that shares the effects of an inevitable biological process in varying degrees. Any public environment routinely inhabited by this population must therefore be reconsidered from several aspects such as biological, psychological and social dimensions, that essentially define a sense of place for all people of all ages.

If the literature correctly implies that satisfaction drives patron loyalty then retailers actively seeking to discover, understand and implement changes to support a population should ultimately increase retail profit according to the current and projected demographic trends.

The most important and basic theory supporting this study is the person-environment fit which conceptually is easy to understand as a balance between the two components. However each component is dynamic by nature and thereby in a state of constant fluctuation. The challenge for the design professional is to creatively provide design solutions that can support this fluctuation. This study has emphasized the importance of user centered inputs to clarify needs, expectations and wants of an aging population
through use of the focus group method.

Participants do recognize and identify challenges they experience in the grocery store and they can also make suggestions regarding alternative solutions to these challenges. However there is considerable concern for the cost of implementing improvements as an indirect increase in the future price of groceries.
Chapter Five: Pulling it all together

Summary

The focus group discussions revealed consistent identifiable challenges that are experienced within the grocery store setting. If a challenge has not been experienced the design feature is usually not consciously evaluated by a patron unless it is a new feature. A brief summary will be discussed here with complete summary results exhibited in the tables in the next section.

Access points into and out of a building were identified as an area that could be redesigned to afford wider pathways, automated equipment, no or very low (less than ¼”) thresholds and placement of entrances and exits near one another, but not shared or immediately next to one another. Handrails located at the entry point are also stated as desirable. The following figures indicate three options.

![Diagram](Figure_36.png)

Figure 36. Entrance A: Entrance and exit all in one place. Original illustration: S. Steenblock.
Another commonly desired design feature that was desired was a transition area between the exterior and interior of the building. This affords protection from the weather elements while waiting for pick up, public phone access, special store information and perhaps an out of the way cart storage.

The parking lot was an area that prompted many concerns regarding close parking and
cart corral access. Without necessarily having to use handicap parking, older folks would like some way to designate parking close to the building for them. Discussion revealed options such as a windshield pass that works like the interstate pass used in the state of Illinois. A camera could scan a barcode on a windshield pass that would allow access into a one-level covered parking area that attached to the grocery store. Maintaining a roofed structure, while not offering an entirely enclosed covered parking option would offer a great deal more protection than open parking. An alternative for access to a one-level covered parking area could be to have an attendant scan passes issued by the grocery store with proof of identification as a person over than age 64. Participants also said they would like wider parking spaces and some space between the front ends of the cars within those spaces to allow for cart storage rather than use existing, remote cart storage corrals.

For individuals who do not mind walking from cart corral to car, they requested that the cart storage be roof covered to prevent precipitation build up in inclement weather. If the storage looked more like a covered bus stop, then carts could still be stored outside in a protected area. This might also prevent falls due to slippery or uneven ice. Push carts were by far the preferred option to offer stability and support during shopping. It was evident that being able to use fully charged motorized carts was a concern.

In an effort to more easily locate items, it was thought that segmenting aisles would help. This idea also makes the aisle seem shorter both physically and mentally and participants believed they would actually experience less fatigue. Even with segmented aisles, they still wanted some of the extra end caps to offer seating for rest or socializing out of the way of traffic. Participants also believed a consistent aisle width throughout the store
would support better function overall.

Shelving consistently presents challenges with extended reaching for both upper and lower levels. Resolving this concern involves consideration of content reduction or ways to bring merchandise to the shopper. Solutions are fixtures that afford smaller and lower design or implementing mechanically operated fixtures to bring items to the customer.

The literature review noted common concerns since the early 1970s. Focus group discussions reveal many of these same concerns remain issues today. Signage and wayfinding continue to be challenging and discussions suggest a need for duplication of signage as well as implementing electronic maps for item location. While checkout points are not considered to be perfect there is a greater concern with transporting purchase items to a customer’s mode of transportation. All participants preferred that the grocery store offer carry out service.

Concern for locating and managing the restrooms was consistent among the focus groups. Existing restroom layouts have tried to make room for larger handicap toilet stalls essentially cutting back on the number of available toilets and minimally meeting the five foot turnaround requirement. The following illustration is a typical example of this attempt.
Efforts have been made to increase the amount of available maneuvering space in restroom layouts and to incorporate additional areas for infant care; available toilet stalls remain limited. The following illustration has made attempts to improve challenges with maneuvering space but could benefit further by automated toilets, lavatories and doors, and by increasing the area designated as handicap toilet stalls. Handrails should be added to all toilet stalls and there are privacy issues with the access point.
Figure 40. Photographic illustration of an updated accessible public restroom.
Photographic illustrations are referenced at the end of the paper.
Human figures illustrations are referenced at the end of the paper.

Efforts to design restrooms that meet ADA guideline requirements and function to meet the needs of universal users, require certain design features be in place such as elevated
toilets and handrails. Wall-hung comfort height toilets (19” height) should be installed as well as wall-hung lavatories to ensure foot and knee access. Participants preferred to have handrails available on every toilet not just those that were designated as handicap. Access to and size of the restrooms were common issues. Two alternatives resulted from discussions: a handicap restroom similar to family restrooms used in shopping malls, or the preferred layout, an open access plan found in many airports with wide access entrance/exit points. The following figures indicate what participants considered as improvements for restrooms in grocery store settings.

Figure 41: Schematic of an airport style restroom layout with an open entrance.
Original diagram by S. Steenblock.
Wheelchair figure referenced at the end of the paper.
Figure 42: Schematic illustration of an adaptation of the family style restroom layout using automated door entrances/exits. Standard restroom is separate from the handicap restroom. Original diagram by S. Steenblock. Wheelchair figure referenced at the end of the paper.

Discussion: Answering the research questions

The initial gathering of the focus groups all began with some opening questions that were intended to help the participants feel at ease and comfortable talking to the group. After the project was described to the group and informed consent forms were obtained, a casual discussion took place. Brief discussion topics included how long they had lived there, whether they shopped alone or with a friend, if they drove on their own or rode with a friend or bus, did they enjoy cooking and how did they perceive the task of grocery shopping. The answers to most of these questions were mixed, but most perceived grocery shopping as exercise and/or a social opportunity; it was a way to get out of the house and
experience a change in scenery. It should be noted that at least one focus group unanimously agreed that grocery shopping was a chore.

The initial observation stage in this research process suggested that there would likely be differences between the needs, abilities, attitudes, expectations, preferences and perceptions of the 65+ population and those aged under 65. These observations were the basis for the focus group discussion framework and it was in discussing the researcher’s initial impressions with the participants that the challenges were recognized. The task of grocery shopping is concerned significantly with mobility and sensory input interpretation. While it does not appear that their experiences are significantly different from individuals under the age of 65, it does appear that for elderly shoppers, some tasks are more challenging than others due to altered abilities and they have become aware of these challenges. While, this population segment does believe their needs are somewhat different from a younger population there does not seem to be a general consensus regarding expectations to redesign public spaces to meet the needs of an aging population.

In an effort to understand if an ever growing older population believes that design and retail professionals should focus their efforts to modify routinely visited public spaces, this second research question attempted to encourage them to verbalize their expectations. As was expected, the question of need versus want surfaced early in the discussions of every group. The majority of participants did reveal that changes were desirable but they could not admit that changes were necessary for them to manage the environment. This paper seeks to promote optimal functioning within an environment which would mean using words such as, “master the environment.” Based on the frequency of the word
“manage” during discussions, this researcher concludes that there is need for environmental change.

This argument also addresses the third research question regarding whether or not interior design features should be changed to address independence issues or relying upon community assistance for help complete independent activities of daily living (IADL’s). The case has been clearly revealed that population numbers following the baby boomer generation significantly decline. Statistics discussed earlier suggest there will likely be fewer available employees to help older individuals perform the grocery shopping tasks and therefore design features within the space should be reconsidered to accommodate this shortcoming. This is an argument for exercising creativity to optimize environmental resources.

Research questions four and five seek discovery of specific data that older people identify as challenges or design features that support their independent grocery shopping performance. In an effort to study and compare the data from the previous chapters, tables have been developed that reveal a summary of primary concerns, preferences and appealing new ideas. These tables have been placed at the end of this chapter.

Table 1: Primary concerns of elderly shoppers

Table 2: Primary preferences of elderly shoppers

Table 3: New design feature ideas

As evidenced by Table 1, most of the participants’ main concerns relate to mobility and sensory input interpretation. Most participants perceived lighting and temperature as
adequate and had no identified concerns initially regarding these sensory inputs. Odors were not noted unless there were consistently unpleasant odors observed with multiple shopping trips and then were interpreted as being an issue related to store maintenance. Noise within the grocery store environment was not an issue of concern or comment. Table 2 summarizes the preferences of elderly shoppers in the grocery environment. These are improvements they believe would enhance their grocery shopping experience. Many of these were associated with ease for accessibility and rest areas. Table 3 summarizes new design feature ideas or old design ideas used in new ways so that the grocery shopping environment facilitates independent performance of elderly shoppers. Many of these ideas consider use of technology.

Research question number six sought to discover whether design feature changes would increase perceived satisfaction with the grocery shopping experience for older customers. All of the focus groups touched upon the same major topics thereby proving that there are consistent design challenges that are recognized throughout the older community. The participants agreed that redesigning these design features would improve their level of satisfaction and if these changes were completed in an effort to make the lives of elderly people easier they might practice more store loyalty.

Understanding the perceptions, experiences and expectations of an aging population regarding the activities of grocery shopping, change designers’ assumptions of the needs of an aging population. The student researcher had some impressions based on observations prior to the focus group discussions. Some of the impressions were validated by the discussions and some were proved wrong. For example, the need to push a cart for stability
and the impression of challenges with reach were validated. However, it was observed that
the glass doors on the freezer fixtures looked heavy and were difficult to open. Focus group
discussions refuted this observation and claimed that these doors were not heavy but they
were difficult to keep open and obtain the item desired.

**Recommendations for the future**

In an effort to further validate data results, a larger participant sample would help to
recognize design features that both support independent function and present challenges.
Repeating this study in various regions of the country would likely influence suggestions
from participants to resolve concerns because there may be areas where technology has
already significantly influenced design to resolve some of the local concerns identified in
this study. Different cultural backgrounds could influence personal experiences during
shopping and shopping alone would undoubtedly differ from shopping with someone else
(even of the same age).

Traditionally, focus groups have been used as a method to develop frameworks for
surveys or questionnaires (Morgan, 1993). Taking more time to implement these methods
of qualitative research would likely either further validate what has been learned from
focus group studies or reveal some new findings that could be further investigated through
the use of interviews. Triangulating the data collection by conducting surveys, interviews
and case studies with a few select participants would further reinforce and strengthen what
has been learned thus far. Comparison of these data would enhance credibility of the study.
Due to generational differences and expectations, conducting a longitudinal triangulated
study with selected age categories would reveal the preferences with physical changes over time. Adding an ethnographic or participant based log of personal experiences over time may reveal some otherwise not recognized challenges.

Employing user-centered design (UCD) as a method of programming in the initial stages of design is similar to the post occupancy evaluation (POE). The purpose of the POE is to evaluate an environment after it has been in use to learn about effective design features, to discover what works well and what could use further development within an environment. Lessons learned in the POE method are useful to immediately correct design choices that were not effective and greatly contribute to the body of knowledge in design theory for understanding the person-environment fit (Zeisel, 2006). User-centered design uses this same approach but does it in a manner that evaluates current environments with the intention of immediate application to a developing planned environment. This is a far more humanistic approach to designing an environment and seeks to involve and listen to the end user whether or not they are responsible for the design development through ownership or financial obligation. User-centered design concerns itself with fitting an environment to a person; it makes a place work for users rather than requiring users to “manage” or “get by” in an environment.

Conclusion

The study results reveal some users identified challenges and preferences that currently exist in the grocery store environment. However, participants clearly state that implementing design features that will support or enhance independent performance
would be appreciated but at what cost? The phenomenon of “need versus want” was strongly stated with great concern that any design feature changes made with the intention of supporting independent functioning, especially implementation of technology, will significantly increase the overall cost of groceries.

Given the previously stated differences in generational characteristics, it is this researcher’s belief that generational influences will change expectations, needs, ideas and opinions in the near future with the beginning retirement of the baby boomers.

The 65+ population is beginning to grow rapidly. Understanding the needs and expectations of this population will have a significant influence on the marketplace. Management of any retail grocery store that seeks to know the needs and preferences of this age group will likely have a competitive advantage in the marketplace as this segment of the population will be a major portion of their patrons.

Design professionals can do much to enhance an aging population’s independent functioning in grocery shopping environments. The cultural society in the United States is beginning to recognize the growth of a retired community. Acknowledging the need for design feature changes now and actively participating in an effort to improve the grocery shopping experience will abate growing frustration due to notable shortcomings later. Implementing these changes over time rather than all at once will ease the pain of likely increases in grocery costs in a manner much like the currently advancing technologies in the media communication industry. At first, changes and new technologies are thought to be expensive but over time the costs generally decline and many recognize the value of these new ideas.
Table 1: Primary concerns of elderly shoppers

<table>
<thead>
<tr>
<th>Area</th>
<th>Concerns</th>
<th>Area</th>
<th>Concerns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entrance/Exit</td>
<td>- Cluttered space</td>
<td>Wayfinding</td>
<td>- Forced to wander (moving merchandise)</td>
</tr>
<tr>
<td></td>
<td>- No place to wait</td>
<td></td>
<td>- Size of store forces too much choice</td>
</tr>
<tr>
<td></td>
<td>- No public phones</td>
<td></td>
<td>- Cannot find help to locate items</td>
</tr>
<tr>
<td></td>
<td>- Potential to slip/trip</td>
<td></td>
<td>- Items in multiple locations</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Staples near back of store (milk, eggs, butter...)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Cannot locate restrooms</td>
</tr>
<tr>
<td>Carts</td>
<td>- Jammed push carts</td>
<td>Services</td>
<td>- Services intermingled with grocery merchandise</td>
</tr>
<tr>
<td></td>
<td>- Evidence of weather (wet)</td>
<td></td>
<td>- Pharmacy proximity not near store access point</td>
</tr>
<tr>
<td></td>
<td>- Sanitation concerns</td>
<td></td>
<td>- Floral open to general merchandise (allergies)</td>
</tr>
<tr>
<td></td>
<td>- Storage placement too far</td>
<td></td>
<td>- Minimal privacy for banking</td>
</tr>
<tr>
<td></td>
<td>- Motorized carts not charged</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- No storage for walking device</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aisles</td>
<td>- Crowding</td>
<td>Checkout</td>
<td>- Narrow aisle width to unload cart</td>
</tr>
<tr>
<td></td>
<td>- Displays get in the way</td>
<td></td>
<td>- Desire manned checkout station</td>
</tr>
<tr>
<td></td>
<td>- Long to travel</td>
<td></td>
<td>- Inappropriate use of express lanes</td>
</tr>
<tr>
<td></td>
<td>- Get tired easily</td>
<td></td>
<td>- Bagging own items</td>
</tr>
<tr>
<td>Shelving</td>
<td>- Too high, too low or too deep</td>
<td></td>
<td>- Lack full view of item information (with information $/#...)</td>
</tr>
<tr>
<td></td>
<td>- Depth issue with item recognition</td>
<td></td>
<td>- Payment shelf too small</td>
</tr>
<tr>
<td></td>
<td>- Frequently need to seek help</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pricing Information</td>
<td>- Font too small overall</td>
<td>Redemption Center</td>
<td>- Proximity too close to food</td>
</tr>
<tr>
<td>Label</td>
<td>- Font style not legible</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Sale tags fall off or are easily removed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Store Signage</td>
<td>- Difficult to read shelf tag (eye disease)</td>
<td>Parking</td>
<td>- Lack of designated close parking for elderly patrons</td>
</tr>
<tr>
<td></td>
<td>- Difficult looking up (skeletal changes)</td>
<td></td>
<td>- Cart corral too far</td>
</tr>
<tr>
<td></td>
<td>- Inadequate information/not updated</td>
<td></td>
<td>- Weather exposure</td>
</tr>
<tr>
<td></td>
<td>- Low visibility</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 2: Primary preferences of elderly shoppers

<table>
<thead>
<tr>
<th>Area</th>
<th>Preferences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entrance/Exit</td>
<td>• Automated doors</td>
</tr>
<tr>
<td></td>
<td>• Double sliding doors (8” to 10” wide)</td>
</tr>
<tr>
<td></td>
<td>• 3’ to 4’ handrails (interior side of doors placed 33” to 36” above floor level)</td>
</tr>
<tr>
<td></td>
<td>• At least 2 but preferably 4 access points of entry</td>
</tr>
<tr>
<td></td>
<td>• Entry and exit points near one another but not exactly next to one another</td>
</tr>
<tr>
<td></td>
<td>• Foyer style access points with interior and exterior doors</td>
</tr>
<tr>
<td></td>
<td>• Available seating to wait near large bay windows</td>
</tr>
<tr>
<td></td>
<td>• Access to public phones</td>
</tr>
<tr>
<td></td>
<td>• Information center (television or bulletin board)</td>
</tr>
<tr>
<td></td>
<td>• Exterior overhang at access points</td>
</tr>
<tr>
<td>Carts</td>
<td>• Shallow push carts</td>
</tr>
<tr>
<td></td>
<td>• Charged motorized carts</td>
</tr>
<tr>
<td></td>
<td>• Cart storage (foyer area or inside interior doors)</td>
</tr>
<tr>
<td></td>
<td>• Covered storage outdoors</td>
</tr>
<tr>
<td>Aisles</td>
<td>• Motor cart + push cart + 2 ft. wide</td>
</tr>
<tr>
<td></td>
<td>• 3 push carts wide</td>
</tr>
<tr>
<td></td>
<td>• Aisle split into 2 or 3 segments</td>
</tr>
<tr>
<td></td>
<td>• Maintain width (aisles = cross lengths)</td>
</tr>
<tr>
<td></td>
<td>• Seating available within the aisle</td>
</tr>
<tr>
<td></td>
<td>• Mechanical device to help to stand</td>
</tr>
<tr>
<td>Shelving</td>
<td>• Shorter shelves</td>
</tr>
<tr>
<td></td>
<td>• Drop down merchandise mechanism</td>
</tr>
<tr>
<td></td>
<td>• Graduated shelving for heavier items</td>
</tr>
<tr>
<td></td>
<td>• Bins/scoops for dry goods</td>
</tr>
<tr>
<td></td>
<td>• Pull down/push up shelving</td>
</tr>
<tr>
<td></td>
<td>• Automated shelving</td>
</tr>
<tr>
<td>Store Signage</td>
<td>• Black san serif font on white background (some prefer lighted white on dark blue)</td>
</tr>
<tr>
<td></td>
<td>• Retain dual-sided above-aisle signage</td>
</tr>
<tr>
<td></td>
<td>• Information signs at 4 foot above level on end caps</td>
</tr>
<tr>
<td></td>
<td>• Electronic price checker in each aisle</td>
</tr>
<tr>
<td></td>
<td>• Computerized information kiosks to locate items</td>
</tr>
<tr>
<td></td>
<td>• Digital maps</td>
</tr>
<tr>
<td>Flooring</td>
<td>• Fixed rubber-backed mats at doors and produce department</td>
</tr>
<tr>
<td></td>
<td>• Airflow system at entry for drying/cleaning shoes</td>
</tr>
<tr>
<td>Produce</td>
<td>• Stepped pyramid displays (so fruit doesn’t roll)</td>
</tr>
<tr>
<td></td>
<td>• Bag dispensers located at hip height</td>
</tr>
<tr>
<td></td>
<td>• Disposable towelettes (produce sprayers)</td>
</tr>
<tr>
<td>Frozen Foods</td>
<td>• Sliding glass door on fixtures (contain temp and efficient energy consumption)</td>
</tr>
<tr>
<td>Meat</td>
<td>• Lower countertop near fresh meat display to pick up items</td>
</tr>
<tr>
<td></td>
<td>• Ability to observe meat handling</td>
</tr>
<tr>
<td></td>
<td>• Seating available while waiting for meat order</td>
</tr>
<tr>
<td>Services</td>
<td>• Separate from grocery merchandise</td>
</tr>
<tr>
<td></td>
<td>• Pharmacy near an access point</td>
</tr>
<tr>
<td></td>
<td>• Contain floral (due to allergies)</td>
</tr>
<tr>
<td></td>
<td>• More privacy for bank services</td>
</tr>
<tr>
<td></td>
<td>• Available dining options (Cafe’ or deli)</td>
</tr>
<tr>
<td>Restrooms</td>
<td>• Locate near front of the store</td>
</tr>
<tr>
<td></td>
<td>• Larger or separate handicap/regular</td>
</tr>
<tr>
<td></td>
<td>• Larger stalls with handrails</td>
</tr>
<tr>
<td></td>
<td>• Electronic hand-dryers</td>
</tr>
<tr>
<td></td>
<td>• Automated doors</td>
</tr>
<tr>
<td></td>
<td>• Wider doorways for stalls and entrance/exit</td>
</tr>
<tr>
<td></td>
<td>• Higher toilets</td>
</tr>
<tr>
<td></td>
<td>• Wall mounted toilets and lavatories</td>
</tr>
<tr>
<td>Checkouts</td>
<td>• Manned registers</td>
</tr>
<tr>
<td></td>
<td>• Groceries bagged for the customer</td>
</tr>
<tr>
<td></td>
<td>• See what is purchased as scanned (information on screen)</td>
</tr>
<tr>
<td></td>
<td>• Increase width of checkout space (2 cart widths or at least add an extra 8” to 12”)</td>
</tr>
<tr>
<td></td>
<td>• Long conveyer belt before items reach clerk</td>
</tr>
<tr>
<td></td>
<td>• Payment at the far end of checkout</td>
</tr>
<tr>
<td></td>
<td>• Larger payment shelf</td>
</tr>
<tr>
<td></td>
<td>• More space between checkout and general merchandise</td>
</tr>
<tr>
<td></td>
<td>• Groceries carried to vehicle</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>• Large faced clocks throughout the store</td>
</tr>
<tr>
<td></td>
<td>• Check area for walking assistive devices (walkers and canes)</td>
</tr>
<tr>
<td></td>
<td>• Separate redemption center from grocery store premises</td>
</tr>
</tbody>
</table>
Table 3: New design feature ideas of elderly shoppers

<table>
<thead>
<tr>
<th>Area</th>
<th>New idea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parking</td>
<td>• Roofed cart corrals in the parking lot</td>
</tr>
<tr>
<td></td>
<td>• Limited-access covered parking for elderly shoppers</td>
</tr>
<tr>
<td>Entrances/exit</td>
<td>• Increase the number of access points around the building</td>
</tr>
<tr>
<td></td>
<td>• Check counter for walking assistive devices</td>
</tr>
<tr>
<td></td>
<td>• Airflow system at entry to dry shoes and decrease amount of dirt brought in</td>
</tr>
<tr>
<td>Carts</td>
<td>• Carts in a track system similar to airports to prevent jamming</td>
</tr>
<tr>
<td></td>
<td>• Power strip charger for motorized carts, no need to plug in</td>
</tr>
<tr>
<td>Aisles</td>
<td>• Seating chosen to facilitate standing back up (lift device to assist to stand)</td>
</tr>
<tr>
<td>Shelving</td>
<td>• Graduated shelving for heavier items near bottom of shelf</td>
</tr>
<tr>
<td></td>
<td>• Pull down/push up shelving</td>
</tr>
<tr>
<td></td>
<td>• Backlight or under-shelf lighting</td>
</tr>
<tr>
<td></td>
<td>• Rotating shelving that brings an item to a person’s center of gravity</td>
</tr>
<tr>
<td>Wayfinding</td>
<td>• Signage brought down to eye level at end caps</td>
</tr>
<tr>
<td></td>
<td>• Manned information kiosks for computerized location of items</td>
</tr>
<tr>
<td></td>
<td>• Price checkers that can include item information such as nutritional values or an expiration date of the item</td>
</tr>
<tr>
<td></td>
<td>• Aisle positioning systems, could be phone receiver used in conjunction with a digital map</td>
</tr>
<tr>
<td>Special Diet</td>
<td>• Diet information centers</td>
</tr>
<tr>
<td></td>
<td>• Test kitchen</td>
</tr>
<tr>
<td>Restrooms</td>
<td>• Restroom layout that is open for easier access</td>
</tr>
<tr>
<td></td>
<td>• Automated doors or none at all</td>
</tr>
</tbody>
</table>
Appendix A: Letter of approval

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

DATE: January 21, 2010
TO: Shelley Steenblock
3105 Bayberry Road
Ames, IA 50014

CC: Lori Brunner
158 Design

FROM: Office for Responsible Research

TITLE: Improving the grocery retail experience based on the evolving needs of an elderly population: A study of an aging population’s perspective view of needs and expectations in the retail grocery space

IRB ID: 09-594

Submission Type: New Exemption Date: 15 January 2010

The project referenced above has undergone review by the Institutional Review Board (IRB) at Iowa State University and has been declared exempt from the requirements of the human subject protections regulations as described in 45 CFR 46.101(b). The IRB determination of exemption means that:

• You do not need to submit an application for annual continuing review.
• You must carry out the research as proposed in the IRB application, including obtaining and documenting informed consent if you have stated in your application that you will do so or if required by the IRB.
• Any modification of this research should be submitted to the IRB on a Continuing Review and/or Modification form, prior to making any changes, to determine if the project still meets the federal criteria for exemption. If it is determined that exemption is no longer warranted, then an IRB proposal will need to be submitted and approved before proceeding with data collection.

Please be sure to use only the approved study materials in your research, including the recruitment materials and informed consent documents that have the IRB approval stamp.

Please note that you must submit all research involving human participants for review by the IRB. Only the IRB may make the determination of exemption, even if you conduct a study in the future that is exactly like this study.
Application for approval of research project

SECTION I: GENERAL INFORMATION

Principal Investigator (PI): Shelley Steenblock  
Phone: 515-450-2600  
Fax: 

Degrees: MA  
Correspondence Address: 3105 Bayberry Road Ames, Iowa 50014

Department: Art & Design  
Email Address: DetailsbySAKS@hotmail.com

Center/Institute: Iowa State University  
College: College of Design

PI Level: [ ] Faculty  [ ] Staff  [ ] Postdoctoral  [ ] Graduate Student  [ ] Undergraduate Student

Alternate Contact Person:  
Email Address: details@iastate.edu

Correspondence Address: same as above  
Phone: alternate phone 515 268-8934

Title of Project: Improving the grocery retail experience based on the evolving needs of an elderly population:

A study of an aging population's perspective view of needs and expectations in the retail grocery space

Project Period (Include Start and End Date): [01/15/09] to [08/31/09] estimated dates only

FOR STUDENT PROJECTS

Name of Major Professor/Supervising Faculty: Lori Brunner  
Signature of Major Professor/Supervising Faculty: 

Phone: 515-294-8284  
Campus Address: 158 College of Design office 397

Department: Art & Design  
Email Address: lbrun@iastate.edu

Type of Project: (check all that apply)

☐ Research  ☑ Thesis  ☐ Dissertation  ☐ Class project

☐ Independent Study (490, 590, Honors project)  ☐ Other. Please specify: 

KEY PERSONNEL

List all members and relevant experience of the project personnel. This information is intended to inform the committee of the training and background related to the specific procedures that each person will perform on the project.

<table>
<thead>
<tr>
<th>NAME &amp; DEGREE(S)</th>
<th>SPECIFIC DUTIES ON PROJECT</th>
<th>TRAINING &amp; EXPERIENCE RELATED TO PROCEDURES PERFORMED, DATE OF TRAINING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shelley Steenblock: BSN and actively pursuing MA in Art &amp; Design</td>
<td>Conduct focus groups, analysis of data,</td>
<td>Graduate thesis project; ISU Human Subjects Training 12/03/09</td>
</tr>
<tr>
<td>Lori Brunner: BS, Architectural Studies, University of Illinois at Urbana-Champaign (UIUC) MUP, Urban Planning, UIUC MFA, Interior Design, ISU</td>
<td>As my major professor she will be helping to guide my process of study which includes correctly establishing methods for research collection and applying those methods and assisting</td>
<td>Assistant Professor in Art &amp; Design at ISU, active in graduate thesis and research; ISU Human Subjects Training 5/9/03</td>
</tr>
</tbody>
</table>

Office for Responsible Research/IRB 05/05/09
<table>
<thead>
<tr>
<th>PhD, Education, ISU</th>
<th>in my understanding and interpretation of data analysis.</th>
</tr>
</thead>
</table>

**FUNDING INFORMATION**

| ☐ Internally funded, please provide account number: |
| ☐ Externally funded, please provide funding source and account number: |
| ☐ Funding is pending, please provide OSPA Record ID on GoldSheet: |
| Title on Gold Sheet if different from above: |
| ☐ Other: (e.g., funding will be applied for later) |
| ☒ Student Project—no funding or funding provided by student |

**SCIENTIFIC REVIEW**

Although the assurance committees are not intended to conduct peer review of research proposals, the federal regulations include language such as "consistent with sound research design," "rationale for involving animals or humans" and "scientifically valuable research," which requires that the committees consider in their review the general scientific relevance of a research study. Proposals that do not meet these basic tests are not justifiable and cannot be approved. If an assurance review committee(s) has concerns about the scientific merit of a project and the project was not competitively funded by peer review or was funded by corporate sponsors, the project may be referred to a scientific review committee. The scientific review committee will be an ad hoc and will consist of your ISU peers and outside experts as needed. If this situation arises, the PI will be contacted and given the option of agreeing that a consultant may be contacted or withdrawing the proposal from consideration.

☐ Yes ☒ No Has or will this project receive peer review?

If the answer is "yes," please indicate who did or will conduct the review:

If a review was conducted, please indicate the outcome of the review:

**COLLECTION OR RECEIPT OF SAMPLES**

Will you be: (Please check all that apply.)

☐ Yes ☒ No Receiving samples from outside of ISU? See examples below.

☐ Yes ☒ No Sending samples outside of ISU? See examples below.

Examples include: genetically modified organisms, body fluids, tissue samples, blood samples, pathogens.

If you will be receiving samples from or sending samples outside of ISU, please identify the name of the outside organization(s) and the identity of the samples you will be sending or receiving outside of ISU. If the outside organizations have not been identified, please check no for both questions above.

N/A

Please note that **some samples may require a USDA Animal Plant Health Inspection Service (APHIS) permit, a USPHS Centers for Disease Control and Prevention (CDC) Import Permit for Etiologic Agents, a Registration for Select Agents, High Consequence Livestock Pathogens and Toxins or Listed Plant Pathogens, or a Material Transfer Agreement (MTA)**

EH&S Website

Office for Responsible Research/IRB 05/05/09
ASSURANCE

- I certify that the information provided in this application is complete and accurate and consistent with any proposal(s) submitted to external funding agencies.
- I agree to provide proper surveillance of this project to ensure that the rights and welfare of the human subject or welfare of animal subjects are protected. I will report any problems to the appropriate assurance review committee(s).
- I agree that I will not begin this project until receipt of official approval from all appropriate committee(s).
- I agree that modifications to the originally approved project will not take place without prior review and approval by the appropriate committee(s), and that all activities will be performed in accordance with all applicable federal, state, local and Iowa State University policies.

CONFLICT OF INTEREST

A conflict of interest can be defined as a set of conditions in which an investigator’s or key personnel’s judgment regarding a project (including human or animal subject welfare, integrity of the research) may be influenced by a secondary interest (e.g., the proposed project and/or a relationship with the sponsor). ISU’s Conflict of Interest Policy requires that investigators and key personnel disclose any significant financial interests or relationships that may present an actual or potential conflict of interest. By signing this form below, you are certifying that all members of the research team, including yourself, have read and understand ISU’s Conflict of Interest policy as addressed by the ISU Faculty Handbook (http://www.provoat.iastate.edu/faculty) and have made all required disclosures.

☐ Yes ☑ No Do you or any member of your research team have an actual or potential conflict of interest?

☐ Yes ☐ No If yes, have the appropriate disclosure form(s) been completed?

SIGNATURES

Signature of Principal Investigator: ___________________________ Date: 12/07/09

Signature of Department Chair: ___________________________ Date: 12/07/09

PLEASE NOTE: Any changes to an approved protocol must be submitted to the appropriate committee(s) before the changes may be implemented.

Please proceed to SECTION II.

SECTION II: IRB SECTION - STUDY SPECIFIC INFORMATION

Please complete all of the following questions.

STUDY OBJECTIVES

Briefly explain in language understandable to a layperson the specific aim(s) of the study.

Based on user input, the end goal is to discover whether or not there are particular design features within the grocery store setting that present significant challenges for independent use for an aging population; these features could then be studied to redesign in such a way to support or enhance independent grocery shopping tasks.

Office for Responsible Research/IRB 05/05/09 3
BENEFITS TO SOCIETY AND PARTICIPANTS

Explain in language understandable to a layperson how the information gained in this study will advance knowledge, and/or serve the good of society. Please also describe the direct benefits to research participants; if there are no direct benefits to participants, indicate that. Note: monetary compensation cannot be considered a benefit to participants.

Our population is significantly aging. Continuing to live independently is very important to most of us and rethinking the design of any public spaces frequently used by an aging population will contribute to sustaining independence in older age groups. Anything that can be accomplished to help sustain mental and physical well being of older people will benefit the population in general because it will have economic benefits.

PART A: PROJECT INVOLVEMENT

1) □ Yes ☑ No Is this project part of a Training, Center, Program Project Grant?
   Director Name: Overall IRB ID:

2) □ Yes ☑ No Is the purpose of this project to develop survey instruments?

3) □ Yes ☑ No Does this project involve an investigational new drug (IND)? Number:

4) □ Yes ☑ No Does this project involve an investigational device exemption (IDE)? Number:

5) □ Yes ☑ No Does this project involve existing data or records?

6) □ Yes ☑ No Does this project involve secondary analysis?

7) □ Yes ☑ No Does this project involve pathology or diagnostic specimens?

8) □ Yes ☑ No Does this project require approval from another institution? Please attach letters of approval.

9) □ Yes ☑ No Does this project involve DEXA/CT scans or X-rays?

PART B: MEDICAL HEALTH INFORMATION OR RECORDS

10) □ Yes ☑ No Does your project require the use of a health care provider's records concerning past, present, or future physical, dental, or mental health information about a subject? The Health Insurance Portability and Accountability Act established the conditions under which protected health information may be used or disclosed for research purposes. If your project will involve the use of any past or present clinical information about someone, or if you will add clinical information to someone's treatment record (electronic or paper) during the study, you must complete and submit the Application for Use of Protected Health Information.

PART C: ANTICIPATED ENROLLMENT

<table>
<thead>
<tr>
<th>Estimated number of participants to be enrolled in the study</th>
<th>Total: Intended range is between 48-60 participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check if any enrolled participants are:</td>
<td>Check below if this project involves either:</td>
</tr>
<tr>
<td>□ Minors (Under 18)</td>
<td>X Adults, non-students</td>
</tr>
<tr>
<td>Age Range of Minors:</td>
<td>□ Minor ISU students</td>
</tr>
<tr>
<td>□ Pregnant Women/Fetuses</td>
<td>□ ISU students 18 and older</td>
</tr>
<tr>
<td>□ Cognitively Impaired</td>
<td>□ Other (explain)</td>
</tr>
<tr>
<td>□ Prisoners</td>
<td></td>
</tr>
</tbody>
</table>

List estimated percent of the anticipated enrollment that will be minorities if known: Not known

American Indian:
Asian or Pacific Islander:
Latino or Hispanic:

Office for Responsible Research/IRB 05/05/09
PART D: PARTICIPANT SELECTION

Please use additional space as necessary to adequately answer each question.

11. Explain the procedures and rationale for selecting participants, including the inclusion and exclusion criteria (e.g., where will names come from, what persons will be included or excluded and why, etc.).

   The best way to contact older independently living community members is through discussion of my study with retirement living centers here in Ames. There are a few of these communities that have graduated living in that they do accommodate those individuals who are able to live alone as well as those who need varying degrees of assistance. I am interested in those who are able to live alone. I plan to work within these communities because there is a structured framework already provided for activities that range from physical exercise, social and tasks such as grocery shopping. Many of the retired living communities in Ames provide transportation to grocery stores in an effort to maintain independence. My criteria for inclusion for this study are that participants live in the Ames area retirement communities and do actively shop and cook for themselves.

12. Describe the procedures for contacting participants (e.g., letter, email, flyer, advertisements, phone call, etc.). Attach copies of any letters, scripts, flyers, or advertisements that will be used. Recruitment materials should include a statement of the voluntary and confidential nature of the research.

   I will be conducting focus group meetings at different sites and at each site participant recruitment is just slightly different.

   At Green Hills Retirement Community (site A), I will be inserting a flyer to notify residents of planned focus meetings in the newsletter that is automatically sent to all residents and a message will also be posted on the campus television channel. The staff has requested that I do indicate an RSVP by a certain date so that they may help with development of a phone roster of independent living residents that I could call a day or two prior to the scheduled meetings as a reminder call.

   At Northcrest Retirement Community (site B), an information flyer to notify residents of planned focus meetings will be placed in the newsletter that is automatically sent to all residents, these same flyers will be placed on bulletin boards around the building where independent residents do view these boards, a message will appear on the campus television channel and I will need to give brief personal presentations, that simply include the very same information on the flyers, at a few social events Northcrest already has scheduled in an effort to recruit participants. An RSVP response will be made available by placing a signup sheet in the activity participation notebook that is kept at the main front desk.

   Keystone and Stonehaven apartments (site C and D) are managed by the same staff but are located at two different places within Ames. I will be inserting a flyer to notify residents of planned focus meetings in the newsletter that is automatically sent to all residents as well as post this same information on four bulletin boards throughout each of the buildings. The management has suggested that my best option for participation may be to schedule these focus group meetings following scheduled congregate meals that approximately an average of 20 residents attends.

   At Windsor Oaks, I will supply several copies of the same information flyer I have used for all the other locations to the Board of Directors. He has requested that he then personally deliver these invitations to residents that meet my requirements. This way he feels he can help with encouraging participation as well.
PART E: RESEARCH PLAN

Include sufficient detail for IRB review of this project independent of the grant, protocol, or other documents.

13. The information needed here is similar to that in the “methods” or “procedures” sections of a research proposal—it should describe the flow of events that will occur during your interactions with subjects. Please describe in detail your plans for collecting data from participants, including all procedures, tasks, or interventions participants will be asked to complete during the research (e.g., random assignment, any conditions or treatment groups into which participants will be divided, mail survey or interview procedures, sensors to be worn, amount of blood drawn, etc.). This information is intended to inform the committee of the procedures used in the study and their potential risk. Please do not respond with “see attached” or “not applicable.”

This study examines the recognition of the interaction between human behavior and design features within a public retail space (the grocery store); therefore it is qualitative in nature. photographic analysis of existing conditions of local retail grocery stores and general observations of how people use existing design features, regardless of age, will provide a basis for comparison between retail environments as well as how different age cohorts use and manipulate the design features. I will be a nonparticipant observer of shoppers in the existing grocery stores within Ames. The population I intend to recruit as participants will be individuals who reside independently in a planned retirement community, an assisted living community and/or a continuing care retirement community. These individuals continue to live independently, meaning they attend activities in the community and shop for their own groceries on a regular basis. This is a purposive sample rather than a random sample. I plan to begin recruitment by discussing the study with program directors of local retirement facilities (written and signed permission documents are attached with this application). Upon approval of the program directors I will then schedule a time to hold focus group discussions on site for independent residents. At the beginning gathering of this meeting I will begin with a brief presentation of the study and what it is I hope to discover (their perceived challenges) followed by the discussion group. Upon commencement of this group meeting I will extend an invitation to accompany a resident in the grocery setting to conduct further observation and obtain any additional thoughts or impressions regarding physical challenges that become evident with task participation in context. This activity is optional based solely upon interested volunteers. I would meet these individuals at the designated grocery store at the agreed upon scheduled visit for the community from which they live. Participants would use the routine transportation they usually do with grocery shopping activities. I have discussed the fact I do want to work closely with site staff so that they are and remain aware of all interaction between myself and their residents. Tasks I am interested in observing and discussing are those that consider reach, site, mobility, sensory input, navigation, and interpretation of information to name a few. I am not interested in what items are purchased or the amount of money spent upon purchase.

14. For studies involving pathology/diagnostic specimens, indicate whether specimens will be collected prospectively and/or already exist “on the shelf” at the time of submission of this review form. If prospective, describe specimen procurement procedures; indicate whether any additional medical information about the subject is being gathered, and whether specimens are linked at any time by code number to the participant’s identity. If this question is not applicable, please type N/A in the response cell.

N/A

15. For studies involving deception or where information is intentionally withheld from participants, such as the full purpose of the study, please explain how persons will be deceived or what information will be withheld. Additionally, a waiver of the applicable elements of consent will be needed. Please complete the “Waiver of Office for Responsible Research/IRB 05/05/09
Elements of Consent® form (available at the IRB website). If this question is not applicable, please type N/A in the response cell.

N/A

PART F: CONSENT PROCESS

A copy of any translated informed consent documents and an English version should be submitted with the application. Provide the name of the individual who translated the consent documents, their qualifications for translating documents, and in particular informed consent documents, below.

If the consent process does not include documented consent, a waiver of documentation of consent must be requested. If any information about the study is intentionally withheld or misleading (i.e., deception is used), a waiver of the elements of consent must be requested. Forms for requesting waivers are available at the IRB website.

16. Describe the consent process for adult participants (those who are age 18 and older).

Immediately prior to conducting a focus group meeting, I will introduce myself and the study to all gathered participants. I will ask them to sign a consent form to agree to participate and allow them to ask me any questions regarding what it is I am hoping to discover or any procedural information.

17. If your study involves minor children, please explain how parental consent will be obtained prior to enrollment of the minor(s).

N/A

18. Please explain how assent will be obtained from minors (younger than 18 years of age), prior to their enrollment. Also, please explain if the assent process will be documented (e.g., a simplified version of the consent form, combined with the parental informed consent document). According to the federal regulations assent “…means a child’s affirmative agreement to participate in research. Mere failure to object should not, absent affirmative agreement, be construed as assent.”

N/A

PART G: DATA ANALYSIS

19. Describe how the data will be analyzed (e.g. statistical methodology, statistical evaluation, statistical measures used to evaluate results).

I will conduct an analytical review of all information contained within the transcribed notes from each focus group discussion. This information will be studied to identify commonly occurring benefits or challenges experienced within the grocery shopping environment concerning the design features and layout of the setting. Information will be categorized based on experience by the shopper within the setting regarding design features and will be evaluated from the perspective of ease of use by an older individual. Any particular surprise observations or recommendations for improvement recognized during the focus group discussions or following the discussions will be noted in a summary analysis of each discussion. This information will direct suggestions for design developments of any future design improvements within the grocery store setting. The only other person(s) that will be able to view any of my collected data will be my major professor, Lori Brunner and possible my two other committee members, Christine Cook and/or Amy Mikovec.
PART H: RISKS

The concept of risk goes beyond physical risk and includes risks to participants' dignity and self-respect as well as psychological, emotional, legal, social or financial risk.

20. □ Yes ☒ No Is the probability of the harm or discomfort anticipated in the proposed research greater than that encountered ordinarily in daily life or during the performance of routine physical or psychological examinations or tests?

21. □ Yes ☒ No Is the magnitude of the harm or discomfort greater than that encountered ordinarily in daily life, or during the performance of routine physical or psychological examinations or tests?

22. Describe any risks or discomforts to the participants and how they will be minimized and precautions taken. Do not respond with N/A. If you believe that there will not be risk or discomfort to participants, you must explain why.

There is not likely to be risk involved because the topic is not one that is controversial. It is a simple discussion about routine grocery shopping activities. No personal information need be shared, no identification for inclusion in case studies will obtained or retained and no permanent record of mailing lists, phone lists or e-mail lists will be sustained.

23. If this study involves vulnerable populations, including minors, pregnant women, prisoners, the cognitively impaired, or those educationally or economically disadvantaged, what additional protections will be provided to minimize risks?

An aged population may be considered a vulnerable population but conducting focus group discussions in their normal environment should minimize any risk or discomfort they may experience in participation; also no personal identification will be obtained or retained.

PART I: COMPENSATION

24. ☒ Yes □ No Will participants receive compensation for their participation? If yes, please explain.

Do not make the payment an inducement, only a compensation for expenses and inconvenience. If a person is to receive money or another token of appreciation for their participation, explain when it will be given and any conditions of full or partial payment. (E.g., volunteer will receive $5.00 for each of the five visits in the study or a total of $25.00 if he/she completes the study. If a participant withdraws from participation, they will receive $5.00 for each of the visits completed.) It is considered undue influence to make completion of the study the basis for compensation.

A drawing from participant names will be done for a $25.00 gift card to a local grocery store at the completion of each focus group discussions and the recipient will be required to sign a research participant receipt form to indicate they were the winner of compensation for participation.

PART J: CONFIDENTIALITY

25. Describe below the methods that will be used to ensure the confidentiality of data obtained. (For example, who has access to the data, where the data will be stored, security measures for web-based surveys and computer storage, how long data or specimens will be retained, anticipated date that identifiers will be removed from completed survey instruments and/or audio or visual tapes will be erased, etc.)

All signed informed consent forms will be retained in my possession (in my lockable file in my studio). Any individuals with a need to view these would need to obtain permission from myself. Once audio tapes
have been transferred into transcripts the tapes will be erased and the tapes and transcripts will be kept in a locked file cabinet along with all signed consent forms. These documents will only be retained for the length of the open study period and will then be destroyed by shredding. No names will be identified in the transcripts; I am not interested in obtaining personal identification only the statements made will be transcribed but no personal identification will be documented.

PART K: REGISTRY PROJECTS

26. To be considered a registry: (1) the individuals must have a common condition or demonstrate common responses to questions; (2) the individuals in the registry might be contacted in the future; and (3) the names/data of the individuals in the registry might be used by investigators other than the one maintaining the registry.

☐ Yes ☑ No Does this project establish a registry?

Checklist for Attachments

Listed below are the types of documents that should be submitted for IRB review. Please check and attach the documents that are applicable for your study:

☑ A copy of the informed consent document OR ☐ Letter of introduction containing the elements of consent
☐ A copy of the assent form if minors will be enrolled
☐ Letter of approval from cooperating organizations or institutions allowing you to conduct research at their facility
☑ Data-gathering instruments (including surveys)
☑ Recruitment fliers, phone scripts, or any other documents or materials participants will see or hear

The original signed copy of the application form and one set of accompanying materials should be submitted for review. Federal regulations require that one copy of the grant application or proposal be submitted for comparison with the application for approval.

FOR IRB USE ONLY:

Action by the Institutional Review Board (IRB):

☐ Project approved. Date: ____________________________
☐ Project is exempt. Date: 1/15/10 ____________________________
☐ Project not approved. Date: ____________________________
☐ IRB approval is not required. Date: ____________________________
☐ Project is not research according to the federal definition.
☐ Project does not include human subjects as defined by the federal regulations.

IRB Approval Signature: ____________________________ Date: January 15, 2010
SECTION III: ENVIRONMENTAL HEALTH AND SAFETY INFORMATION

☐ Yes ☑ No Does this project involve human cell or tissue cultures (primary or immortalized), or human blood components, body fluids or tissues?

PART A: HUMAN CELL LINES

☐ Yes ☑ No Does this project involve human cell or tissue cultures (primary or immortalized cell lines/strains) that have been documented to be free of bloodborne pathogens? If the answer is "yes," please answer question 1 below and attach copies of the documentation.

1) Please list the specific cell lines/strains to be used, their source and description of use.

<table>
<thead>
<tr>
<th>CELL LINE</th>
<th>SOURCE</th>
<th>DESCRIPTION OF USE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2) Please refer to the ISU "Bloodborne Pathogens Manual," which contains the requirements of the OSHA Bloodborne Pathogens Standard. Please list the specific precautions to be followed for this project below (e.g., retractable needles used for blood draws):

N/A

Anyone working with human cell lines/strains that have not been documented to be free of bloodborne pathogens is required to have Bloodborne Pathogen Training annually. Current Bloodborne Pathogen Training dates must be listed in Section I for all Key Personnel. Please contact Environmental Health and Safety (254-5359) if you need to sign up for training and/or to get a copy of the Bloodborne Pathogens Manual [http://www.els.iastate.edu/erv/default.asp?active-articleID=214]

PART B: HUMAN BLOOD COMPONENTS, BODY FLUIDS OR TISSUES

☑ Yes ☑ No Does this project involve human blood components, body fluids or tissues? If "yes," please answer all of the questions in the "Human Blood Components, Body Fluids or Tissues" section.

1) Please list the specific human substances used, their source, amount and description of use.

<table>
<thead>
<tr>
<th>SUBSTANCE</th>
<th>SOURCE</th>
<th>AMOUNT</th>
<th>DESCRIPTION OF USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eg., Blood</td>
<td>Normal healthy volunteers</td>
<td>2 ml</td>
<td>Approximate quantity, assays to be done.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2) Please refer to the ISU "Bloodborne Pathogens Manual," which contains the requirements of the OSHA Bloodborne Pathogens Standard. Specific sections to be followed for this project are:

N/A

Anyone working with human blood components, body fluids or tissues is required to have Bloodborne Pathogen Training annually. Current Bloodborne Pathogen Training dates must be listed in Section I for all Key Personnel. Please contact Environmental Health and Safety (254-5359) if you need to sign up for training and/or to get a copy of the Bloodborne Pathogens Manual [http://www.els.iastate.edu/erv/default.asp?active-articleID=214]
Research participant form

Iowa State University
Research Participant Receipt Form (RPRF)
Use if this payment is less than $75

Iowa State University (ISU) is required to maintain the confidentiality of information about research study participants while still complying with record keeping requirements of the State of Iowa, the Internal Revenue Service (IRS), and funding agencies. The purpose of this form is to serve as documentation of the receipt of compensation associated with participation in a research study conducted by ISU personnel.

I, ____________________________, have received or am requesting compensation in the form and amount indicated below:

☐ Cash $__________
☐ Check $__________
☐ Gift Certificate/Card $__________
☐ Other Property – Describe: ________________________________

Value: $__________

__________________________  __________________________
Research Participant Signature        Date

TO ISU PERSONNEL:
Research participants may be given the opportunity to participate without receiving payment if they choose not to complete this receipt form.

This form provides documentation for gift certificates/cards or other property purchased by ISU p-card—keep original form as part of your p-card documentation.

If an ISU check needs to be issued for payment, attach RPRF to completed honoraria voucher and submit to Accounting, 3606 ASB.
Focus Group Study Invitation

Date: 
Time: 
Place: 

Dear Resident,

I am a student at Iowa State University pursuing a graduate degree in Interior Design. As part of my program of study, I am required to conduct a research study on an area of interest to me. I have a special interest in learning more about improving the design of public environments frequently visited by an aging population. I therefore am cordially inviting you to join myself and other residents from your community in a focus group discussion concerning your experience in using the grocery store environment. I am hoping to have at least 6 to 10 participants for each meeting. I am particularly interested in hearing your thoughts about:

- challenges you encounter while shopping for groceries and how you currently resolve those challenges
- any particular design features that you believe work particularly well
- any recommendations for improvements that could make your experience in using the store easier.

Thank you so very much for considering participating in this group discussion. Please RSVP to the front desk at (phone number) to indicate your intended participation by (insert a date here). If you have any questions feel free to contact me at 450-2600. I will be contacting you to remind you of the discussion session and hope you do intend to come.

Sincerely,
Shelley Steenblock; ISU Graduate Student
Participant consent form

CONSENT FORM FOR:

Improving the grocery retail experience based on the evolving needs of an elderly population:
A study of an aging population’s perspective view of needs and expectations in the retail grocery space

This form describes a research project. It has information to help you decide whether or not you wish to participate. Research studies include only people who choose to take part—your participation is completely voluntary. Please discuss any questions you have about the study or about this form with the project staff before deciding to participate.

Who is conducting this study?

This study is being conducted by
Shelley Steenblock: BSN, Creighton University at Omaha, Nebraska
    and actively pursuing an MA in Art & Design at Iowa State University in Ames, Iowa (Interior Design)
Lori Brunner: BS, Architectural Studies, University of Illinois at Urbana-Champaign (UIUC)
    MUP, Urban Planning, UIUC
    MFA, Interior Design, ISU
    PhD, Education, ISU

Why am I invited to participate in this study?

You are being invited to participate in this study because user centered input leads to a more successful design in the spaces frequently used by older individuals. This information allows designers to re-evaluate of any assumptions about designing for an older population.

You are being asked to take part in this study because you are over the age of 65 living independently as a resident in a retirement community within the Ames area. Living independently, you do routinely shop for groceries and cook your own meals. You should not participate if you do not cook and travel to the grocery store to purchase food items.
What is the purpose of this study?

The purpose of this study is to examine the built grocery store environment for customer satisfaction and it’s supporting personal physical fit for the 65+ and older consumer population. This study is dependent upon obtaining user input regarding how the built environment of the grocery store supports or presents challenges to changing needs and physical abilities of aging participants and to understand how these challenges impede ability to successfully independently complete grocery shopping tasks.

What will I be asked to do?

If you agree to participate in this study, your participation will last for the 2-3 hour time interval needed to present the study and complete participation in one focus group discussion. You will not be expected to answer every question during the focus group discussion but your active participation in the discussion would be greatly appreciated. Any additional (optional) time would be strictly voluntary and would include a routine shopping visit accompanied by the researcher to allow the researcher to observe actual shopper behavior in the grocery shopping environment and listen to any additional user impressions that may occur in context. You will be asked to participate in a focus group discussion regarding your personal experiences in using the built grocery store environment; that is your opinion on how easy or difficult it is to use all design features. Audio taping will be conducted during the focus group discussions merely for the purpose of developing transcripts for referral during data analysis. Once transcripts have been complete all recordings will be erased and upon completion of the study all transcripts will be destroyed.

What are the possible risks and benefits of my participation?

Risks – While participating in this study there is not likely to be any foreseeable risk involved because the topic is not one that is controversial. It is a simple discussion about routine grocery shopping activities and how each participant evaluates use to the built grocery shopping environment. No personal information need be shared; no identification for inclusion in case studies need be obtained and no permanent record of mailing lists will be sustained.
Benefits – If you decide to participate in this study there may not be any immediate or direct benefit to you. It is hoped that the information gained in this study will benefit society by emphasizing an awareness of the need to involve an aging population in the design or redesign of the built grocery store setting to enhance support or support independent grocery shopping abilities. Our society is aware of the “Graying of America” phenomenon. Never before in history has there existed the large numbers of over the age 65+ individuals and many assumptions have been made regarding the needs and abilities of this population sector. Actively involving an older demographic group concerning their impressions and interpretations of their needs and abilities is critical in supporting the overall population in long term planning for continuing to live independently.

How will the information I provide be used?

The only information that will be documented as a result of the focus group discussions and any information observed in context will be in regard to how the design features of the grocery environment is used, such as ease of use with navigation, reach, locating items, mobility and need for rest (basically information that pertains to physical usage of the environment). An analytical review of all information contained within the transcribed notes from each focus group discussion will be studied to identify commonly occurring benefits or challenges experienced within the built grocery shopping environment concerning the design features and layout of the setting. Information will be categorized based on experience by the shopper within the setting regarding design features and will be evaluated from the perspective of ease of use by an older individual. Any particular surprise observations or recommendations for improvement recognized during the focus group discussions or following the discussions will be noted in a summary analysis of each discussion. This information will direct suggestions for design developments of any future design improvements within the grocery store setting.

What measures will be taken to ensure the confidentiality of the data or to protect my privacy?

Records identifying participants will be kept confidential to the extent allowed by applicable laws and regulations. Records will not be made publicly available. However, federal government regulatory agencies, auditing departments of Iowa State University, and the ISU Institutional Review Board (a committee that reviews and approves research studies with human subjects) may inspect and/or
copy your records for quality assurance and analysis. These records may contain private information.

To ensure confidentiality to the extent permitted by law, the following measures will be taken. No identification during audio taping or transcription to notes will be done. Mailing lists will be obtained and maintained at the retirement living community directors office; no direct identification of any participant will be retained for the purposes of this study and if results are published at any time in the future all identities of participants will remain confidential.

Will I incur any costs from participating or will I be compensated?

You will not have any costs from participating in this study you will not be compensated for participating in this study however you will have an opportunity to participate in a drawing to win a gift card to a local grocery store. This drawing will take place upon the close of the focus group discussions. If your name is the name drawn as the winner for the gift certificate you will be required to sign a research participant receipt form which will be maintained with all other data documentation in a locked file in a design studio at Iowa State University.

What are my rights as a human research participant?

Your participation in this study is completely voluntary and you may refuse to participate or leave the study at any time. If you decide to not participate in the study or leave the study early, it will not result in any penalty or loss of benefits to which you are otherwise entitled. By not participating however you will not be entitled to have your name included in the grocery gift card drawing.

Whom can I call if I have questions or problems?

You are encouraged to ask questions at any time during this study.

- For further information about the study contact Shelley Steenblock at (515) 268-8934 or (515) 450-2600. Contact may also be conducted through e-mail at details@iastate.edu.
- In the event you are not successful in making contact with Shelley Steenblock, Professor Lori Brunner may be contacted at 158 College of
Design, Iowa State University office 397, phone # (515) 294-8284 or lbrun@iastate.edu.

- If you have any questions about the rights of research subjects or research-related injury, please contact the IRB Administrator, (515) 294-4566, IRB@iastate.edu, or Director, (515) 294-3115, Office for Responsible Research, Iowa State University, Ames, Iowa 50011.

Consent and Authorization Provisions

Your signature indicates that you voluntarily agree to participate in this study, that the study has been explained to you, that you have been given the time to read the document and that your questions have been satisfactorily answered. You will receive a copy of the written informed consent prior to your participation in the study. Participant’s Name (printed) ________________________________

__________________________   ______________________
(Participant’s Signature)           (Date)

__________________________   ______________________
(Signature of Parent/Guardian or Legally Authorized Representative)   (Date)

Investigator Statement

I certify that the participant has been given adequate time to read and learn about the study and all of their questions have been answered. It is my opinion that the participant understands the purpose, risks, benefits and the procedures that will be followed in this study and has voluntarily agreed to participate.

__________________________   ______________________
(Signature of Person Obtaining Consent)   (Date)
Methods of Research

The Focus Group
In order to collect data that will reflect perceptions, opinions, concerns and attitudes related to personal experiences in grocery shopping, the focus group is the best research tool to use. Group interviews promote small group discussion regarding how each individual responds and adapts to the grocery store environment. Group discussion and interaction between group members will illicit further insight and may reveal perceptions that may otherwise not have been recognized by simply collecting data through survey questions. Guided discussion by a moderator will keep the discussion on task and allow for a deeper understanding of existing personal abilities and potential needs for changes within the grocery store environment. This qualitative information serves also to check the researcher’s assumptions or predictions related to changing needs of elderly participants in these public spaces. This is particularly true because the target audience is different from the researcher. Conducting a series of focus group discussions will ensure that the expressed ideas and notions are shared more widely by the local elderly community.

Scheduling time and place:
Once I have made contact with the retirement communities in Ames and they have agreed to participate in my focus group study, I will then schedule a time of day or evening that the facility director believes to work best for the residents. With their approval I will plan to conduct my meeting at the main building of the facility. At this time, my intention is to have two meetings at each residential community with my goal being to complete six focus groups.

Purpose:
The purpose of this focus group meeting is to discuss how the environment of the grocery store supports or presents challenges to changing needs and physical abilities of an aging population.

Goal:
Discussion by all members of the group, based on their experiences, will provide focus for common design features that present challenges and identify design features that support independent functioning. Development of strategies for
redesigning grocery store environments that enhance independent functioning is the goal based on user centered input.

**Participant Selection:**
Qualifications for inclusion for this study are that participants:
- are currently retired
- live in the Ames community
- shop for groceries and cook
- continue to live independently

I will contact retirement living communities around the Ames area to determine which facilities offer independent living to their prospective residents. Once this has been determined, I will discuss my intentions for this study with the facility directors and ask them to help me make contact with individuals that meet my above stated criteria to voluntarily participate in focus group discussions. With facility permission I will display posters as reminders, mail flyers and make reminder phone calls at one week and two days prior to the scheduled meeting. As incentive for participation at each focus group center, I will have a drawing from participants to win a gift card worth $25 in groceries to a local grocery store.

**The moderator will say the following:**
"Hello and welcome to this focus group discussion about grocery shopping. I appreciate you voluntarily taking time from your schedule to come today. The purpose of this focus group meeting is to discuss how the environment of the grocery store supports or presents challenges to changing needs and physical abilities for our elder community members. This discussion will provide focus for common design features that present challenges and identify design features that support independent functioning. Development of strategies for redesigning grocery store environments that enhance independent functioning is the goal based on aging user centered input."

"My name is Shelley Steenblock and I am a graduate student at ISU in the interior design department. I am interested in discovering if there are design features in the grocery environment that work particularly well for you and those that present particular challenges for you. I am not here to convince you of anything. There is no right or wrong answers; I'd like to know your experiences in shopping"
for groceries now and in the last few years. My job is to ask you questions and help the discussion along in any way I can”.

"In an effort to help me remember what was said I will be audio recording this and I have brought Jane Doe along to help me take notes so I don’t miss anything. I will be asking questions to the group and each of you can take turns in responding, only one at a time please. Not every person has to respond to every question but I would greatly appreciate everyone participating because that will give me the richest information from you. This is an open discussion so feel free to jump in and comment on each other’s remarks. I would also appreciate it if cell phones could be turned off temporarily and there were not any side conversations apart from our discussion. All your answers will be kept confidential. I will not be writing your name next to your comments. We are scheduled to meet here for two hours. I have provided some refreshments for you so feel free to obtain those whenever you wish just let me know if as a group you feel the need for a break.”

"I would like everybody to print their name on a piece of paper; we will put these in the box and at the conclusion of the focus group study that I am conducting here at FACILITY X, I will do a drawing from a pool of participant names to win a $25 gift card for groceries to a local grocery store.”

“Does anyone have any questions regarding how we will proceed?”

I would like to meet each of you first before we begin and I encourage you to wear a name tag as that will help me to address you appropriately.”

**Part 1: Opening questions**

Ice breaker questions get things moving so when they introduce themselves ask them, “How long they have lived here. Do they shop with a friend, family member or alone? Is grocery shopping a necessary task, good exercise, a social opportunity or just fun and relaxing? Do they enjoy cooking? Is there a particular store they prefer to shop at?” (Come back to this later).

**Part 2: Introductory questions**

“Think for a moment about shopping for groceries when you were younger. And now. Compare these experiences. What differences can you think of? What seems easier or more difficult?”
Part 2: Transition questions
"Are there any specific differences between the different types of grocery stores available to shop in here in town?"

Part 2: Key questions (Follow up with asking for suggestions for improvement)
Focus topic #1. “Let’s begin by talking about the entrances/exits of the grocery stores.”

Probes:
- Is opening the door a challenge?
- Can you pass through unassisted with ease?
- Is there adequate space for passage of more than one person?
- Does cart storage get in the way of entering/exiting?
- What method do you usually use to collect groceries? Why?
  Basket, cart or automated ride
  - Basket: does it get heavy, only need a few items
  - Cart: offers support, holds a lot, get tired of pushing
  - Automated: easy to manage aisles, hassle to get on or off, crowds aisles

Focus topic #2. “Most grocery store layouts use shelving and aisles. What can you tell me about your experience within the aisles?”

Probes:
- Is there adequate space between the shelves to allow easy passage of customers?
- Do displays get in the way?
- Do you ever feel the need to rest?
- Can you read item and price markers on the shelf?
- Can you find items on the shelves?
- Do the shelves seem dark when searching for an item?
- I can reach the top shelf easily.
- I can reach the bottom shelf easily.
- Some items are too heavy to lift, too large or too bulky.
- I need to ask for help to reach items.
Focus topic #3. “Stores frequently reorganize, do stocking changes and reposition items when updating aisles. Tell me about how you perceive finding your way around the store.”

Probes:
- How easy is it to locate what you need?
- Do you frequently need to ask for help?
- Can you read the aisle item indicators?

Focus topic #4. “What has been your experience with an ability to distinguish between products inside the Grocery stores?” Please talk about lighting and color.

Probes:
- Lighting inside the store is adequate.
- Lighting is frequently too bright or has glare.
- Low lighting makes it a challenge to see merchandise.
- It is hard to tell the difference between item colors.
- Whether fixture design supports visualization of items or makes it difficult to tell one item from the next

Focus topic #5. “Signage is essential to maneuvering the stores layout. Do you pay attention to signage? How easy is it to read and use signage to help you navigate the store?”

Probes:
- I can easily see and read the signage.
- The font size seems adequate or not.
- I can make out the letters easily.
- Sign placement is best overhead or placed at eye level?
- Are signs lit up to enhance reading them?
- Signs that indicate other departments are marked well?

Focus topic #6. “Some departments require muscle strength and an ability to reach across rather than up or down. How would you evaluate your ability to:

Probes:
- Open freezer doors to obtain item and place it into the basket?
- Reach across the tabletop to retrieve produce and place into the basket?
- Reach above the glass case to obtain meat or baked goods?
- Manipulate the space at the checkout to unload the cart

Focus topic #7. “Describe other sensory experiences you have when shopping in the grocery store.”

Probes:
- How is the temperature?
- Can you hear store announcements?
- Do certain smells encourage you to buy things?
- Would you enjoy music? “

Focus topic #8. “Tell me what you like best and least about the grocery store you shop most at. What store is your favorite? Elaborate as to why you think this.”

Probes:
- Choice, value, convenience, sample day, recipe exchange, social outing, exercise, welcoming atmosphere

Focus topic #9. “Indicate words that describe how grocery store environments make you feel.”

Probes:
- Please talk about the different sizes of stores available such as national chains (Wal-Mart), regional chains, (Hy-Vee) or local stores (Fareway).
- Words may include: cozy, warm, cold, friendly, easily managed, challenging, open, vast, intimidating, noisy, confusing, welcoming, anxious, value, helpful, crowded.

Part 3: Closure
The moderator states, “To summarize our discussion today, it is my understanding that these are the particular issues that as a group you have identified as presenting challenges.” State any/all issues identified.

“Design features that seem to support optimal functioning in grocery shopping are ...” state any identified.
"Suggested improvements identified include the following. Are there anymore comments or information that anyone would like to share?"

"As evidenced by this discussion, it appears that the environment of the grocery store can influence the ease with which our elderly community members are able to shop for groceries independently. By user centered participation in identifying design features that currently exist to offer support and identifying design features that present challenges, design strategies can be developed to redesign the shopping environment to enhance the ability of older people to continue to live and function independently."

"Have we missed anything? If for any reason you should think of anything else that you would like to add you can notify the activities director to pass on the information to me. Thank you all so much for coming and participating in this discussion."
Appendix B: Definitions

**Accessibility** - building environments in such a way to increase the ability to maneuver independently even in the case of decreased mobility. In 1990 the US Government passed the guidelines for public buildings to meet accessibility standards.

**ADA** - Americans with Disabilities Act (1990), requires public buildings be built in a manner that allows easy access and mobility for individuals that are physically challenged.

**ADAAG** - Americans with Disabilities Act Accessibility Guidelines.

**Adls (Activities of Daily Living)** - those activities that are essential for self-care such as eating, bathing, toileting.

**Attribute** - notable feature that sets something apart from others.

**Autonomy** - an ability to control oneself within any given environment or situation.

**Cohort** - a group of people that fit into a designated unit of time such as baby Boomers.

**Competence** - an ability level, physical or mental.

**Demographics** - understanding the influence of a particular age or culture to a region.

**Dependency ratio** - the number of working individuals that contribute financially to help support one retired person in the United States.

**Design feature** - specific attribute of an item or place.

**Determinant** - a significant attribute that encourages someone to choose a particular place, thing or manner.

**Distress** - experienced stress that causes illness and declining abilities; negative stress.
Ecosystem - natural balance between living beings and the environment.

Emic perspective - to discover and clarify how and why people interpret and assign meaning to the data.

Environmental press - the challenge an environment presents.

Eustress - experienced stress that supports development and learning; positive stress.

Gerontology - the study of aging with an emphasis on age 65 to the end of life.

IADLS (Instrumental Activities of Daily Living) - activities that support independent functioning such as shopping, attending church.

Illumination - measure or perception of light given off by a fixture.

Independence - ability to do things for oneself.

Maslow’s hierarchy - a ranking of basic human needs according to priority. Each level must be met before any attempt of meeting the next level begins. The levels are food and shelter, followed by safety, psychological needs and emotional needs for development.

Objective - without attachment, no previously formed opinion.

Perceived - assigning meaning to sensory inputs.

Strategy - well thought out plan or approach to solve a challenge.

Subjective - under human influence or opinion, emotional, preconceived idea.

Universal design - an area of focus in design that supports all ages and abilities. Applies to structure or gadgets in an effort to support independent functioning.

Visitability - the manner of building an environment that allows ease of access for anyone not just those who routinely inhabit a space but also visitors.
Appendix C: Referenced photographic image sources

All images were retrieved on-line through Google in the spring of 2010 and the websites are listed along with a small insert of the image.

Figure 3. Photographic images of shopping cart examples.
Motorized shopping cart
http://en.wikipedia.org/wiki/Motorized_shopping_cart

Typical shopping carts
http://www.designboom.com/history/cart_typologies.html

Figure 4. Photographic illustration of a traditional grocery store schematic floor plan.

Figure 6. Photographic illustration of a revised grocery store schematic floor plan.

Figure 30. Photographic illustration of an example of digital map schematic.
Grocery store schematic plan
http://www.ezblueprint.com/examples.html

Figure 5. Photographic illustration of a typical modernized grocery store schematic floor plan.
Grocery store floor plan
http://www.sun-prairie-wisconsin.com/copps-grocery-list.html
Figure 9. Photographic illustration of a sturdy bench with open area below.
Wood bench
http://www.gooseandrudys.com/w/2016/vch3.jpg

Figure 10. Photographic illustration of portable lift assistance devices for seating
http://assistivetechservices.com/MobilityAndAccess.aspx

Figure 11. Photographic illustration of flooring systems (rubber mats and in-floor airflow system detail).
Rubber mats

http://www.webstaurants.com/finger-top-entrance-mat-36-x-72-5-8-thick/finger-top-entrance-mat-36-x-72-5-8-thick.jpg

http://www.baa.co.nz/~jpm/file/Aeration-Systems/aeration-6.jpg
Figure 12. Floorometry™ non-slip flooring system
http://www.c-sgroup.com/floorometry/products

Figure 13. Photographic illustration of under shelf lighting and LED rope
http://www.phantomlighting.com/images/gallery/lg_image/Phantom-Bookcase-b.jpg

Figure 14. Photographic illustration of an example of graduated shelving.
Graduated shelving
http://www.displayit-info.com/acrylic/acrylic2_shelf.html
Figure 15. Photographic illustration of dry goods bins.
Dry goods bins with scoops

Figure 16. Photographic illustration of shelving item price labels

Figure 16. Photographic illustration of shelving item price labels
http://www.treehugger.com/ibm-eink-shelf.jpg

Figure 17. Photographic illustration of the light spectrum and examples of colored font on different colored backgrounds.

Figure 18. Photographic illustration of examples of information computer kiosk.
Computerized information kiosk
http://www.arcdesignconsulting.com/
Figure 19. Photographic illustration of freezer displays options

http://www.ameliasgroceryoutlet.com/store-newholland-freezer.jpg

http://bushref.com/images/refrig/glass%20door%20freezer%204.jpg

http://www.acedirect.ie/images/Mareno%20Well%20and%20Wall%20Freezer.jpg

Figure 20. Photographic illustration of a fresh meat display case

http://img.archiexpo.com/images_ae/photo-g/refrigerated-butcher-counter-lay-display-case-171249.jpg

Figure 21. Photographic illustration of a standard floral displays

http://www.allamericanshelingco.com/id79.html

Figure 22. Photographic illustration of an example of a dietary consult kiosk and a demonstration/test kitchen.

http://www.bbqsandwichking.co.th/images/express_kiosk.jpg
Figure 22. Photographic illustration of an example of a dietary consult kiosk and a demonstration/test kitchen.

Figure 23. Diagrammatic sketch of a standard checkout station
http://www.freepatentsonline.com/6648127-0-large.jpg

Figure 24. Photographic illustration of examples of louvered, troffer and direct-indirect lighting
Louvered lighting and direct-indirect lighting.

Figure 24. Photographic illustration of examples of louvered, troffer and direct-indirect lighting
http://www.lightingamericaofohio.net/images/troffer_coverOn_CROP_Small.jpg

http://www.smgov.net/uploadedImages/Departments/OSE/Categories/Energy/Direct-Indirect%20Light%20Fixture.jpg
Figure 25. Photographic illustrations of the “Giving Cart”™ by Klever Marketing.
Figure 26. Photographic illustration of the charging station for the “Giving Cart”™ by Klever Marketing.
“Giving cart”™ by Kleve Marketing
http://www.kleverkart.com/system_components.html

Figure 25. Photographic illustrations of the “Giving Cart”™ by Klever Marketing.
“Giving cart”™ by Kleve Marketing
http://www.designboom.com/history/cart/t15.jpg

Figure 27. Photographic illustration of the “Scan It”™ pricing gun.
“Scan it”™ Charger and close up images

Figure 27. Photographic illustration of the “Scan It”™ pricing gun.
“Scan it”™ Charger and close up images
Close up:
http://www.coolest-gadgets.com/20090225/scan-it-allows-you-to-check-out--your-own-groceries/

Close up: http://www.littlegreenandmean.com/?paged=2
Figure 28. Photographic illustration of the “Concierge™” shopping cart.
The “Concierge™” shopping cart

Figure 29. Photographic illustration of an example of a phone information receiver.
Information wall phone
http://www.phonesonsale.com/itt-8900w.html

Figure 31. Photographic illustration of the PowerPad™ charger.
PowerPad™ charger
http://www.pcmag.com/article2/0,2817,2087430,00.asp

Figure 32. Photographic illustration of a rotisserie appliance.
Rotisserie appliance
http://www.caljumps.com/jumpers.html

Figure 33. Photographic illustration of pull down shelving.
Pull down shelving
http://www.hgtv.com/decorating/closet-design/index.html
Figure 34. Photographic illustration 24: Diago™ mechanized wall cabinet lift.
Figure 35. Photographic illustration of the “Diago”™ mechanized wall cabinet lift diagram.
Diago™ mechanized wall cabinet lift
http://universal-design-products.com/diago_wallcabinet_lift.htm

Figure 40. Photographic illustration of an updated accessible public restroom.
Modern public Restroom
http://contexts.org/graphicsociology/2009/11/06/a-better-public-bathroom-by-design/

The following two images were used in figures 35, 36, 37, 39, 40 and 41:
Wheelchair in plan view
http://www.accesscode.info/general/4_1s.htm

Man in plan view
Referenced sources


http://findarticles.com/p/articles/mi_m0675/is_3_20/ai_86230658/


http://www.agts.edu/faculty/faculty_publications/articles/creps_generations_chart.pdf


http://factoidz.com/time-a-precious-commodity/


KleveerCarts (2009). Retrieved spring 2010 at:

http://assets.aarp.org/rgcenter/il/2002_03_homes.pdf


http://esa.un.org/unup

Prince Market Research (2007). “Aging in place in America” study commissioned by Clarity and the EAR Foundation. Retrieved spring 2010 at:


and at: http://quickfacts.census.gov/qfd/states/19000.html


