Education as a Means to Influence Awareness of and Stigma

Toward Aging in Place Residential Assistive Devices

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by

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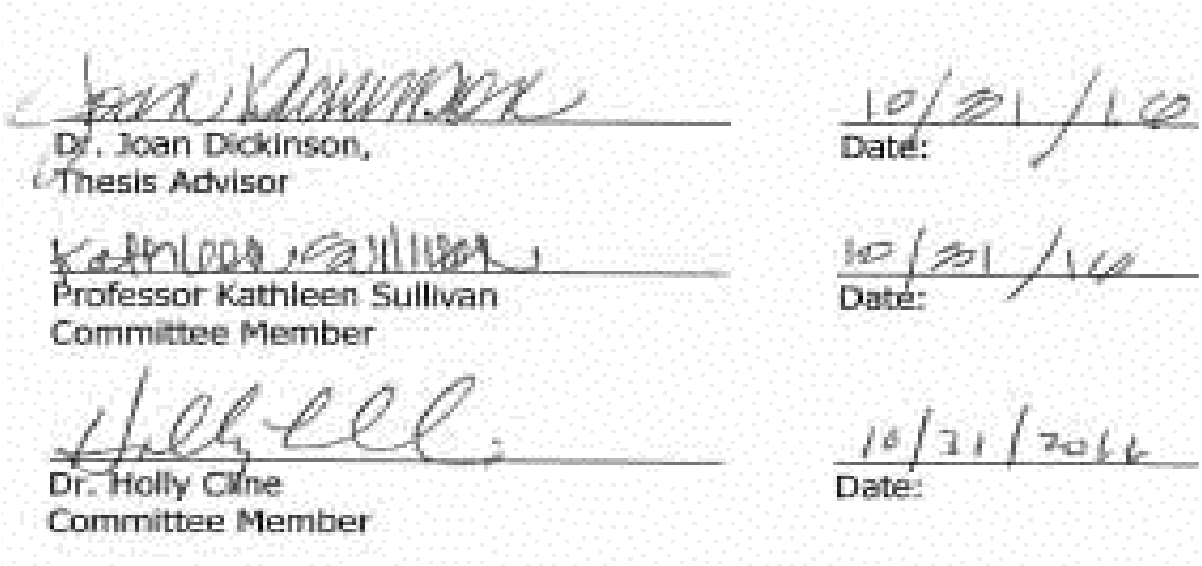

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Abstract

Aging in place (AIP) in one's existing residence is thought to be a more affordable housing alternative (Ahn, Beamish, & Goss, 2008; HAC, 2014) than assistive living or nursing homes and is desired by 91% of those aged 50 to 80 (Philips, 2014b, 2014c). AIP cannot successfully occur, however, without considerable residential upgrades to accommodate the physical and mental degenerative affect aging has on the body and also because research has revealed U.S. housing as severely lacking in the assistive devices required to respond to those needs (JCHS, 2014a). In support, findings reveal assistive device implementation can slow the decline of elderly functionality and also reduce the cost of long-term institutionalization and certain in-home personnel costs through a systematic upgrade approach (Mann, Ottenbacher, Fraas, Tomita, & Granger, 1999). Yet, only 20% of those aged 40 and older have sought information on long term care, which includes knowledge on AIP upgrades, and in one study only 28% have begun to upgrade (The Associated Press-NORC Center for Public Affairs Research [AP-NORC], 2014) and 9% in another (Merrill Lynch, 2014). This is a problem, considering boomers comprise almost 24% of the population (Raphelson, 2014).

This experimental study, using design thinking strategies, was conducted in order to understand whether boomer awareness of and stigma toward AIP residential assistive devices and the term and concept of *aging in place* were factors influencing AIP device adoption, and whether education, via a truncated list of expert recommended AIP checklist devices, could influence both. Pre-test results from 15 boomer participants revealed average individual and group knowledge of devices was minimal, that stigma exists toward some devices, and that stigma toward devices could be swayed when arbitrated within groups. Individual AIP device knowledge doubled during the stimulus, average stigma toward over half of the devices present

in both the pre-test and test decreased, and in the post-test, individuals were unable to name any additional assistive devices. Results from this study suggest education was able to increase boomer knowledge of assistive devices and the term *aging in place*. Results on stigma toward the term *aging in place* revealed a small percentage felt stigma toward the term and the concept. Results on device stigma as an adoption barrier, however, were inconclusive. Finally, this study used participant created prototypes to understand the means by which boomers would like to be educated on AIP upgrades.

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Chapter 1: Problem

Amounting to almost a quarter of the population, boomers are the second largest generation in the U.S. (Raphelson, 2014). Of this group, 91% want to age in place (AIP) in their current residence (Philips & Global Social Enterprise Initiative at Georgetown's McDonough School of Business [Philips], 2014b) and 85% would prefer to face long-term care at home (Merrill Lynch, 2014). The majority of them have that choice, since 80% own their home (Joint Center for Housing Studies of Harvard University [JCHS], 2014a).

Based on these statistics, one would expect boomers have been actively implementing residential assistive devices in preparation for their extended stay. Research revealed, however, that U.S. residences are sorely lacking in AIP readiness (AP-NORC, 2014; Baker, 2012; JCHS, 2014a; JCHS, 2015; Philips, 2014b) with only 1% having five AIP features (JCHS, 2014a). These five features include devices that are vital to independent functionality and the wellbeing of elderly and disabled persons.

Ironically, boomers have been actively renovating, but mostly for lifestyle improvements such as aesthetics, comfort, and versatility (JCHS, 2015; Merrill Lynch, 2014). In addition, 59% have said they are not interested in implementing AIP assistive devices in their homes (Philips, 2014b). Lifestyle renovations boomers engaged in frequently coincided with the same areas experts recommend for AIP upgrades. Also, some of these areas are identified as having a high occurrence of fall risk, including exterior walkways, decks and porches, and interior areas including bathrooms and kitchens (Baker, 2014a; JCHS, 2015; Merrill Lynch, 2014; National Association of Home Builders [NAHB], 2015; Stevens, Mahoney, & Ehrenreich, 2014). The fact that boomers have been actively renovating in areas both targeted for AIP upgrades and known

for high fall risk, without incorporating AIP features, suggests a lack of education has been a reason for adoption inactivity.

AIP assistive device stigma was also thought to play a role in why boomers are not renovating. As a group phenomenon, boomers are particularly sensitive to being classified as old and stigmatize or reject anything to do with aging or disability (Barnhart & Peñaloza, 2013). Visible assistive devices such as wheelchairs or walkers are known to have stigma associated with them (Skogsrød, 2015; Vaes, K., Jan Stappers, P., Standaert, A., & Desager 2012), but research was not found that associates visible stigma with AIP assistive devices. It is also known elder or disability products can promote negative stereotypes through product visibility. However, it is not known which AIP assistive devices boomers are aware of or feel stigma toward due to negative advertising. The fact that some boomers reject anything to do with aging suggests stigma has played a role in AIP upgrade inactivity.

Purpose of the Study

This study investigated boomers' lack of AIP upgrade activity by exploring their awareness of and stigma toward AIP residential assistive devices and the term *aging in place*. In this study, it was proposed that boomer AIP terminology awareness and device familiarity was limited. It was also thought that some of the awareness boomers have of devices was due to the stigma they attribute toward those devices. Additionally, the researcher felt boomers have not begun AIP upgrades due to some residential assistive devices being viewed as a source of visible stigma and negative marketing campaigns that stereotypically identify boomers as elderly or disabled (Skogsrød, 2015; Vaes, et al., 2012). Raising awareness through education and changing negative attitudes has been proven as an effective means for reducing stigma toward

disability (World Health Organization [WHO], 2011). Therefore, this research used education via an expert-recommended AIP Checklist to influence awareness and stigma.

Justification of the Study

Due to the impact an enormous elderly population without accessible housing will have on our future U.S. infrastructure and families, this study was conducted to learn more about the problem and to propose possible ways to educate boomers about AIP assistive devices and upgrading their homes. Effective AIP requires the implementation of multiple assistive devices that help support and transition older adults' waning mental and physical abilities, yet maintains a safe and socially supportive living environment (JCHS, 2014a). This is backed by multiple experts and 66% of older adults who felt incorporating AIP assistive devices gave them the confidence and ability to remain in their homes longer (Bayer & Harper, 2000; Housing Assistance Council [HAC], 2014). Due to a gap in research, boomer AIP device awareness is unknown. Current research focuses on boomers' lifestyle renovations, their interest in adopting AIP devices, exploring current AIP upgrade activity, and current housing inaccessibility. No existing research on the extent of boomers' AIP assistive device knowledge suggested there is an assumption that boomers have the knowledge they need to prepare their homes for AIP. A lack of knowledge on these devices may be one of the reasons causing boomers to reject AIP upgrades. This study revealed the AIP features boomer participants were aware of in a pre-test, test and post-test scenario.

Boomer stigma toward getting old (Barnhart & Peñaloza, 2013) and disability (WHO, 2011), along with rejection of elderly and disability products (Merrill Lynch, 2016) was known to exist, but whether stigma was associated toward residential AIP assistive devices was not known. Additionally, visible stigma is known to be attributed to personal assistive devices, but it

was not known if it extended to residential AIP assistive devices. This study reveals the assistive devices boomers feel stigma toward, the degree of stigma felt, the devices boomers attributed with visible stigma, and if product visibility has influenced awareness. It also reveals how stigma has influenced AIP device adoption and home upgrades.

Existing studies found in research unknowingly educated participants on AIP device types through reported AIP features or those provided as choices within a study. Historically, few devices were included, and featured a larger ratio of stigmatized to non-stigmatized devices. This possibly could have led participants to stigmatize AIP features as a whole. In reality, the larger percentage of AIP assistive devices are standard products with AIP characteristics; few of which boomers may associate stigma toward. Unlike other studies, this current research had participants first express their individual knowledge on AIP assistive devices. Then participants were educated using a larger number of expert recommended AIP assistive devices with a truer-to-life ratio of standard features to elderly or disability specific devices.

Many new studies have emerged using design thinking's approach of empathy or human centered design as a means to explore topics on assistive devices (Skogsrød, 2015; Vaes, 2014). Design thinking is not new to research methodology and is often used as a means to extract new insights from problems. It uses those closest to the challenge known as stakeholders to problem seek and solve (Kumar, 2013). In this current research, initial stakeholder discussions revealed unfamiliarity with the term *aging in place*, low device knowledge, and stigma toward AIP assistive devices. To date, no other AIP study had explored familiarity with the technical term *aging in place* as an adoption barrier. Neither had design thinking been used in AIP feature studies as a data collection method to understand boomer knowledge of devices and the influence stigma had toward device adoption. The design thinking strategies prototyping and testing,

especially, had never been used as a data collection method. Group-created prototypes geared toward educating boomers on upgrading their homes for AIP conveyed the influence of prior knowledge and the stimulus. The evaluation revealed the group's thoughts on how well their prototype would educate boomers and their success in dealing with stigma.

Definition of Terms

Accessibility or accessible design. The requirement that a building, product, or service not deter usability by groups having any degree of disability (Centers for Disease Control and Prevention [CDC], 2013).

Activities of daily living. (ADL) Activities of daily living are daily self-care activities such as personal care needs, eating, bathing, dressing, grooming, work, homemaking, leisure, or getting around inside the home (CDC). Activities of daily living are also broken down into instrumental activities of daily living (IADLs) which are the complex skills needed to successfully live independently (CDC). These skills include the following: managing finances, handling transportation (driving or navigating public transit), shopping, preparing meals, using the telephone and other communication devices, managing medications, housework, and basic home maintenance (CDC).

Adoption or adoption rate. The number of society members who start using or implementing a new technology or innovation during a specific time period (Investopedia, 2015). Further, adoption rate is a relative measure, meaning the adoption rate of one group is compared to the adoption rate of another, often of the entire society. The rate of adoption or adoption barriers can be influenced by advantages created by adoption, ease of integration into daily life, other's exposure to the innovation, and initial expense (Investopedia).

Aging in place (AIP). "The ability to live in one's own home and community safely, independently, and comfortably, regardless of age, income, or ability level" (CDC, 2013, ¶ 4).

Ambulatory. Possessing the ability to walk without assistive devices (Department of Justice [DOJ], 2010).

Assistive devices, features, or technology. Assistive technology is defined by the Individuals with Disabilities Act of 1988 as "any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities" (Assistive Technology Industry Association [ATIA], n.d., ¶2). Assistive technology can be low-technology assistive devices like small appliances or architectural features such as grab bars. Assistive technology can also be high technology assistive devices requiring training or skill acquisition. High-tech devices are often electronic in nature such as communication devices, computer software applications, wheeled mobility controls, and electronic aids to assist daily activity (ATIA, n.d).

Autonomous or autonomy. Elderly autonomy is the right of an older person to exercise individual choice, freedom of will, and to assume responsibility for one's own behavior and/or self. Autonomy does have limitations for those who are incompetent or who become so (Georgantzi, 2012).

Baby boomer generation or boomers. Those born in the post-World War II years of 1946 to 1964 (AP-NORC, 2014). Boomers are divided into three groups; older boomers born between 1946 and 1951, middle boomers born between 1952 and 1958, and younger boomers born between 1959 and 1964 (MetLife, 2013).

Extended care. Generalized health or nursing 24-hour care for convalescents or the disabled, when hospitalization is not required (CDC, 2013). Extended care in the past has usually occurred in specialized facilities such as nursing homes.

Independence. See autonomy.

Long-term care. Long-term care refers to a range of medical and social services intended to support the daily needs of those with chronic health problems. The range of services include medical, social, and housing (AP-NORC, 2014).

Nonambulatory. Not possessing the ability to walk. The nonambulatory person requires a caregiver's assistance to transfer to and possibly to propel an assistive device such as a wheelchair (DOJ, 2010).

Ongoing living assistance. Assistance or help with things like keeping house, cooking, bathing, getting dressed, getting around, paying bills, remembering to take medicine, or just having someone check in to see that everything is okay (AP-NORC, 2014).

Product visibility. The social image of a specific product (Vaes et al., 2012). The means by and the frequency with which the image is portrayed influences how people perceive it.

Semi-ambulatory. Possessing a lessened ability to walk. The semi-ambulatory person requires an assistive device such as a cane, walker, or wheelchair (DOJ, 2010).

Stigma. A physical, mental, or social mark linking someone to undesirable characteristics (Skogsrød, 2015; Vaes, et al., 2012). Having a stigma increases one's likelihood of experiencing stressful or threatening situations (Skogsrød, 2015).

Universal design. The design of products and spaces that can be used by the widest range of people possible. Evolved from accessible design, universal design recognizes a wider range of human abilities and at various life stages (Salomon, 2010).

Visible stigma. Stigma felt toward a visible, personal assistive device such as a wheelchair or hearing aid (Vaes, et al., 2012). Products with visible stigma are those that are easily seen. They evoke a negative response and confront prejudice by inspiring pity from others (Skogsrød, 2015; Vaes, et al., 2012).

Chapter 2: Literature Review

Boomer Preference for Aging in Place (AIP)

AIP allows older or disabled adults to live autonomously by addressing physical, mental, and social barriers within their home and the community (CDC, 2013). Currently, of those aged 50 to 80, 91% have expressed a desire to AIP in their current residence and 96% feel it is important to maintain their independence as they grow older (Philips, 2014b, 2014c).

The goal of AIP is to function indefinitely without an in-home caregiver, to eliminate, or at best, reduce extended care costs, and to eliminate or reduce the stress of moving and adapting to another living environment. For AIP to be successful, the interior and exterior environment must be adapted to the elderly person as their physical and mental health degrade (HAC, 2014). This requires home modification with AIP assistive devices and architectural features to aid with navigation, activities of daily living (ADL) and instrumental activities of daily living (IADL). AIP upgrades must also facilitate communication, assure safety and peace of mind for both the elderly and family, allow for visitors, and provide the additional clearance or assistance caregivers will need to help the elderly person with all of the above (Ahn, Beamish, & Goss, 2008; JCHS, 2014b). Elderly environments without AIP assistive devices increase the likelihood of injury leading to unforeseen medical care and costs, the need for caregiving, rehabilitation, decreased time in the home, loss of independence, and possibly death (HAC, 2014; WHO, 2011). Not knowing where to start has been stated as reason for not upgrading for AIP (Philips, 2014a, 2014b). With multiple aspects of AIP to address within the interior and exterior of the home, this literature review looks at not only what assistive devices are needed, but also why they are needed.

The Need for AIP Assistive Devices in Boomer Homes

The primary reason that prematurely forces boomers into facility care environments is not declining health, but an elderly person's unwillingness to adapt their environment with assistive devices and to change their daily compensatory strategies (Curd, 2014) through awareness and improvement. In an American Association of Retired Persons [AARP] (2011) survey, boomers recognize this with over half viewing AIP as a major long-term care concern.

AIP planning takes into consideration the functional and spatial needs of not just the elderly person, but also their future caregiver. Only boomers with hands-on experience in caregiving or with an expertise in AIP services would be aware of these requirements (AP-NORC, 2014). On average, of those who reach the age of 85, 74% experience difficulties with ADL's such as housework and navigating the home (Merrill Lynch, 2014). Semi-ambulatory navigational assistance requires space for both the elder adult and a caregiver. With 85% of older adults choosing the home, not institutional care facilities, as the place to receive extended care (Merrill Lynch, 2014), additional space must also be planned for nonambulatory navigation. Nonambulatory adults require the use of personal assistive devices such as walkers and wheelchairs in tangent with caregiver assistance to navigate. AIP assistive devices that become imperative in an extended care scenario for the home interior and exterior include wider walkways; surfaces that are level, stable, and without tripping hazards; and wheelchair navigation space in and around plumbing fixtures.

Incorporation of assistive devices has the benefit of giving seniors confidence. In fact, over 66% of elderly respondents who incorporated AIP assistive devices felt the upgrades would help them remain in their homes longer than if they had not incorporated the changes (Bayer & Harper, 2000; HAC, 2014). Researchers assert incorporating assistive upgrades could deter the need for long-term care for longer periods, saving families, their caregivers, and the nation

millions of dollars (Curd, 2014). Further, implementation through a systematic approach can reduce certain in-home caregiver costs, reduce the time and cost of possible long-term institutional stays, and slow the decline of elderly functionality (Mann, Ottenbacher, Fraas, Tomita, & Granger, 1999).

Boomer health. There are common ailments among aging adults, but each person's limitations are individualized and progress at different rates. Knowing more about the health issues that generate the need for assistive devices can help with proper device selection. Boomers are a unique generation and so are their health issues.

Elimination of early childhood diseases and medical advances has long cast a positive projection on boomer life expectancy. Indeed, boomers may be living longer than prior generations, but newer studies suggest they may not live well due to a higher frequency of chronic disease and disability with poor lifestyle choices as a possible contributor (King, Matheson, Chirina, Shankar, & Broman-Fulks, 2013). King et al. found quality of life for some boomers is being compromised by 38.7% suffering from obesity, over half reporting no regular physical activity, and a higher propensity for drinking with 67.3% imbibing compared to 37.2% in the previous generation.

Disability is the most common and inescapable health issue for older adults. In general, disability is so entrenched into the human experience that almost everyone at some point in their life will temporarily or permanently experience it themselves or through a family member or friend (WHO, 2011). With more elderly in the boomer generation, the percentage of disabled boomers also rises. In a study comparing boomer disability issues to those of prior generations, King et al. (2013) reported the occurrence of the following issues were higher in boomers: use of assistive walking devices, disabilities limiting their work, and having a functional limitation. As

they age, older adults suffer from decreased mobility, hearing, sight, mental acuity, and other sense related illnesses (WHO, 2011). Finally, of the 65% of who have multiple chronic illnesses, older adults also suffer from a disability that limits their capacity to complete certain ADLs and IADLs (CDC, 2013).

Arthritis is the most common contributor to disability (Barbour et al., 2014). The prevalence of arthritis is significant for many, with 30.2% of middle-aged adults aged 45 to 64 years suffering from its effects and 49.7% of older adults aged 65 or greater (Barbour et al.). Arthritis also decreases dexterity (Barbour et al.), making it difficult to open doors and hold handrails. With the number of boomers increasing yearly, the frequency of arthritis is also expected to increase (Barbour et al.).

Disability, aging, arthritis, and chronic disease can all contribute to falls (CDC, 2013), which are the leading cause of injury and death among older adults (Barbour et al., 2014; Stevens, Corso, Finkelstein, & Miller, 2006). Arthritis causes pain and inflammation that can disrupt one's natural gait, causing a slower pace, cautious steps, or stumbling, making it easier to trip (Barbour et al., 2014). Even a slight disability may cumulatively lead to a fall with millions of elderly Americans aged 65 and older suffering each year (Barbour et al.). In 2006, fall related medical costs for older adults totaled nearly $30 billion (Barbour et al.; Stevens, et al. 2006). The outcome of falls in older adults can be a decline in functional abilities, brain injuries, hip fractures brought about by osteoporosis, reduction in physical and social activities, or death (Barbour et al.; Rubenstein & Josephson, 2006).

A study seeking the circumstances and outcomes of falls for high risk community-dwelling older adults found that 70.5% reported a minimum of one fall during the one-year study period with some falling multiple times (Stevens, et al., 2014). The 465 study participants were

considered high risk if in the year prior to the study the person had either experienced one to two falls without injury or one fall without injury and was documented as having balance problems (Stevens et al., 2014). The common characteristics of those participants who fell were 48.2% aged 75 to 84 years, 72.3% female, and 59.5% lived alone. In general, falls occurred most often among people aged 75 to 84 years (Stevens et al., 2014). Research suggests, however, older adults are not the only ones who suffer from falls and fall injuries. Middle-aged adults, or those who are currently boomers, are also at risk (Barbour et al. 2014; Talbot, Musiol, Witham, & Metter, 2005).

Historically, females have outnumbered males by outliving them, but presently the ratios of males to females in all boomer groups are approaching equality (MetLife, 2013). For example, in 1990 there were 67 men for every 100 women, and in 2014 there were 79 men for every 100 women. By 2030, it is expected there will be 82 men for every 100 women. Recognition of female longevity is important due to other studies highlighting women's propensity for higher fall risk and injury than men, and a prevalence of physical gender differences such as lower-body strength and bone mass that can lead to injury (Stevens, Haas, & Haileyesus, 2011). Because of this, women may require specialized attention in the identification and selection of AIP assistive devices.

The importance of attempting to maintain good health through diet and exercise cannot be underscored as a key to better AIP. In fact, the World Health Organization promotes good physical health as a key factor to promoting mental health and well-being for older adults (Yasamy, Harper, & Saxena, 2013). Most (55%) pre-retirement boomers are interested in fitness and say they plan to exercise regularly in retirement, a statistic that has stayed constant for 13

years (AARP, 2011). Yet most post-retirement boomers reported their health was worse than before retirement (AARP).

Women aged 45 and older, especially, must actively maintain their health due the prevalence of obesity, arthritis, and osteoporosis (Mercola, 2014). Menopause occurs in women anywhere from 45 to 55 years of age. Usually during the ten years following menopause bone loss significantly increases, yet can be counteracted with weight bearing exercise (Mercola, 2014). Exercise or physical therapy, in general, is beneficial for helping arthritis sufferers manage pain, improve gait, balance, and increase body strength (Barbour et al., 2014).

Despite a preemptive push for preventative healthcare over the past several years, most boomers still only become concerned about their health once they have suffered an illness or disability. Too late, or after a health crisis, is also when most older adults become keenly aware of how unresponsive their home environment is to healing and health maintenance. All of these health issues could be prevented, reduced, and even improved with the installation of assistive devices and architectural upgrades (Bayer & Harper, 2000; HAC, 2014; Mann, et al., 1999). With massive numbers on the precipice of disability, boomers need to more proactively face AIP planning.

Elderly disability and the environment. Disability, brought about by aging, reduces our capacity to be supported by our environment (WHO, 2011). In acknowledgement of the multiple factors influencing disabled persons, the World Health Organization and World Bank report transformed the definition of disability from just a medical issue to a multidimensional one including social and environmental components (WHO, 2011). The study asserts one's medical condition along with unsupportive environments and social stigma define disability (Oliver, 1990; WHO, 2011). Therefore, the definition of disability has changed to an encompassing term

including one's impairments, participation restrictions, and activity limitations and the negative interactions a disabled individual experiences within their environment and with those in it (WHO, 2011; Leonardi, Bickenbach, Ustun, Kostanjsek, Chatterji, & MHADIE Consortium, 2006).

Environmental factors influencing disability are the inaccessibility of public and private sites, buildings, and transportation (WHO, 2011). For the elderly and disabled, inaccessible environments create barriers for participation and inclusion (WHO, 2011). Unchanged environments remain unsupportive, emphasize the disability, support exclusion and stigma, and create the potential for accident or death (WHO, 2011).

Changing the environment can decrease barriers, improve health conditions, prevent impairments, and improve outcomes for persons with disabilities (WHO, 2011). Therefore, changing the home environment through assistive upgrades is the only course for boomers who wish to AIP. Many, however, are unsure of where to start (Philips, 2014a). Knowing the areas where a higher frequency of home injuries occur, understanding the activities those injured were engaged in, and learning about ways to increase socialization inside and outside the home might be good starting places.

Due to the more frequent occurrence of falls, some areas within and around the home need addressing more than others. In the Stevens et al. (2014) study, most falls occurred on the exterior of the home with 31.7% occurring in areas characterized as a garden, lawn, or woods; 19.9% on outdoor stairs; and 18.8% on sidewalks or driveways (Stevens et al., 2014). Reducing the need for activities in areas such as gardens and lawns by eliminating high maintenance features is of prime importance to safety. Addressing accessibility in areas such as entrances,

walkways, drives, parking, and mailboxes is required in order to increase safety, mobility, independence, and socialization for older adults.

On the interior of the home, the largest quantity of falls (with and without injury, respectively) occurred in the following areas: the living room (24.7%, 25.8%), bedroom (22.4%, 23.1%), bathroom (17.3%, 7.8%), kitchen (11.4%, 8.5%), hallways (4.7%, 6.8%), stairs (5.1%, 4.0%) and in the dining room (2.0%, 8.3%; Stevens et al., 2014). Findings in the Stevens et al. (2014) study are consistent and expand upon an earlier study by Gill, Williams, and Tinetti (2000) where, despite living in single-floor dwellings, 31% of residents fell in their living rooms, 30% bedrooms, 19% kitchens, 13% bathrooms, and 10% in hallways. To note, the location of falls did differ by age group with those aged 85 and older significantly more likely (73%) to fall inside their home than those aged 65 to 74 (62.5%) and 75 to 84 (67.7%; Stevens et al., 2014).

Of those frequent fall areas, however, the bathroom was the area found with the most statistical significance where falls were almost two and a half times more likely to result in an injury as compared to falls in the living room (Stevens et al., 2014). Women, particularly, were found to have a higher occurrence of fall and injury rate in bathrooms than men (Stevens et al., 2011). Other studies provide additional support and insight as to the specific areas within bathrooms that pose a fall risk and reinforce the need for assistive upgrades. Stevens et al. (2011) found an increased incidence of falls with injury occurring around the toilet and tub or shower. The proportion of injuries that occurred getting on, off, or using the toilet increased with age with the highest occurrence (36.9%) among persons aged 85 or greater, 26.9% for those aged 75 to 84, and 19.3% for those aged 65 to 74 (Stevens et al., 2011).

Among all participant age groups (15 to ≥85 years) in the 2011 Stevens et al. study, the most hazardous activities included bathing, showering, or getting out of the tub or shower. A

reported 66% of injuries for all participants occurred while in the tub or shower, with only 2% occurring while getting in (Stevens et al.). Based on age, fewer falls occurred for those aged 85 or greater with 15.5% of injuries occurring while bathing or showering (Stevens, et al.). With a higher incidence of falls with injury, bathrooms should be prioritized as a place to incorporate accessibility and assistive devices. The Stevens et al. study specifically indicated the installation of grab bars at toilets and tubs as a priority.

The activities leading up to a fall provide reason for having protective measures in place. Research reveals activities older participants were engaged in at the time of a fall were common behaviors (Kochera, 2002; Stevens et al., 2014) such as walking (30.3%), standing up (9.0%), reaching or leaning (7.8%), turning or changing direction (6.1%) and bending or pushing (4.7%; Stevens et al.). However, 29.0% of all falls occurred while people were engaged in "other specified" activities, such as cleaning, opening or closing doors, bathing, and getting into or out of a car (Stevens et al.). Activities leading up to a fall in Stevens et al. align with an earlier study by Kochera (2002). The prior study, however, reported 9% of falls occurring in and around furniture. These activities or scenarios are considered to be common and harmless to most, but for older adults with declining abilities, they become more challenging. The commonality between the instances is direct physical interaction with an environmental element. AIP planning takes such activities into consideration and inserts protective measures to further safeguard older persons with assistive devices that lessen the possibility of injury. For instance, removal of tripping hazards, stable and slip resistant flooring, and chairs that lift and lower the user are assistive devices that remove danger and safeguard activities. Additionally, increasing the musculature system, bone density, and motor skills through exercise or rehabilitation can reduce the risks when interacting with the environment.

The World Health Organization's definition for disability also addresses the social components (WHO, 2011) that result in isolation and loneliness caused by physical disability, bereavement, reduced income, and or chronic disease (Yasamy, Harper, & Saxena, 2013). Loneliness affects some 35% of older adults aged 45 and over (AARP, 2010). Continued participation inside and outside the home in meaningful activities that foster strong personal relationships is a key factor to promoting mental health and well-being for older adults (Yasamy, Harper, & Saxena, 2013). Addressing the physical home environment with accessibility features enables socialization inside and outside of the home. Another means to increase socialization is through incorporation of technology or communication devices such as computers, cell phones, smart phones, and video conferencing. Any misperception about boomers' disinterest in or inability to use technology are dismissed with the revelation that boomers are adopting technology as actively as younger users (O'Conner, 2014; Pew Research Center, 2014). Boomers also find value in technological items they use every day (Philips, 2014a, 2014b, & 2014c).

Knowing where to start home improvements based on safeguarding higher frequency injury areas, knowing the activities prior to injury, and incorporating means to increase socialization are important steps for AIP. However, most boomers are not educating themselves on AIP. Due to the vast number of boomers involved and home upgrades required, experts and governmental agencies will have to intervene with AIP education to advance the cause. The best place to insert societal education on AIP assistive devices may be in and around persons, products, and places used during the renovation process.

General renovation activity. Most older adults find that later in life they have more income and time to improve their homes (Merrill Lynch, 2014). Research suggests boomers started renovations before retirement as early as 2008, and have been actively upgrading their

homes at a rate of nearly two times that of younger homeowners (Setar & Son, 2013). Instead of renovating for AIP, however, boomers are creating their dream home by making it more attractive, comfortable, and versatile (JCHS, 2015; Merrill Lynch, 2014). Homeowners of all ages are actively engaged in the following renovation types: exterior replacements, system upgrades, property improvements, room additions and alterations, interior replacements, kitchen remodels and additions, disaster repairs, bath remodels and additions, energy saving measures, equipment, and appliances (Baker, 2014a; DeZube, 2014; JCHS, 2015; Merrill Lynch, 2014; see Appendix A).

Of those renovating, boomers comprise the bulk (48%) of those spending in the home improvement market with over $91 billion in 2013 (JCHS, 2015; Merrill Lynch, 2014). Improvements consistently found among all studies were energy efficiency upgrades, exterior upgrades, and kitchen and bath improvements (see Appendix A). Energy efficiency projects made up the largest percentage of expenditures in various mid-sized markets with homeowners of all age groups (JCHS). In architectural client studies, energy efficient upgrades included 65% of homeowners implementing attic insulation, 58% triple glaze windows, 53% energy management systems, 60% smart thermostats, 47% Energy Star® appliances, and 90% LED Lighting (Baker, 2014b; see Appendix A). Energy efficiency is a general upgrade implemented by most homeowners that also seamlessly functions as an AIP upgrade for budget wise seniors.

The contradiction in boomer general or lifestyle renovations is that many of the project types boomers and other consumers engage in coincide with those experts recommend for AIP upgrades (Philips, 2014a, 2014b). Even more compelling are the number of general upgrades that coincide with high risk fall areas such as exteriors, kitchens, and baths. Examples of other general renovations that align with AIP upgrades include replacing exterior materials such as

roofing, siding, and exterior doors and interior finish replacements such as flooring and wall finishes (JCHS, 2015). Other top occurring general renovations and those that align with AIP upgrades can be seen in Appendix A.

For most, renovation or upgrade occurs infrequently; therefore, AIP choices should be considered as part of the process. Considering 91% of boomers have expressed a desire to AIP and 96% feel it is important to maintain their independence as they grow older (Philips, 2014b, 2014c), their renovation activity reveals counter-intuitive thinking and planning toward those goals.

AIP Assistive Device Research

Current research shows only 1% of U.S. housing has five or fewer AIP assistive features (JCHS, 2014a). Some homes, such as those built after 2000, have more features than older homes (JCHS, 2014a). Unfortunately, 45% of owners and 48% of renters live in homes built before 1970 (Harrell, 2011). A lack of devices in the home suggests boomers simply may not be aware of residential assistive devices; especially since they live without examples.

Code and residence type (DOJ, 2010; International Code Council [ICC] 2012a; International Code Council [ICC], 2012b; Salomon, 2010) could also be counted as contributing factors for a lack of AIP features in existing homes. Awareness of assistive devices may predominantly come from commercial spaces. Since 1990, the Americans with Disabilities act has instituted accessibility standards within public environments and transportation (DOJ). This has allowed most to become versed in the spatial and equipment standards required for accessible restrooms and egress.

Code-required accessibility can be found within some dwellings. However, the extent is dictated by dwelling type and by the code individual states or local municipalities adopt (ICC,

2012a; ICC, 2012b). Dwellings equipped with the most accessibility features are those that must adhere to federal code and include examples such as nursing homes, assisted living facilities, congregate living facilities (ICC, 2012a), and 5% of apartment and hotel units (DOJ, 2010). None of these residence types are long-term AIP solutions, however, due to either their high cost, limited availability, or the inability to personally upgrade them with additional individualized assistive devices (HAC, 2014; JCHS, 2014a). Single-family homes make up more than 70% of the U.S. housing stock, yet federal and state laws do not generally require them, along with duplexes, triplexes, or multistory townhouses without an elevator, to adhere to accessibility standards (ICC, 2012b; Salomon).

Beyond code, boomers have their own reasons for not upgrading for AIP. A look at research that has examined this problem as a whole reports a large majority (59%) of boomers say they are not interested in upgrading their homes and only 15% are willing to spend "whatever it takes" to make physical, but not technological, updates (Philips, 2014a, 2014b). Another study found 28% of boomers have modified their homes to make them easier to live in as they age and only 20% have begun researching for AIP via ongoing living assistance (AP-NORC, 2014). Another found 9% of boomers renovating in case their health worsens (Merrill Lynch, 2014). Architects reported 65% of clients had incorporated in-home accessibility features (Baker, 2014a). Those found to be more willing to adopt or are already prepared were recipients of care who have completed several AIP planning activities such as researching and modifying their home to make it easier to live in as they grow older (AP-NORC, 2014).

Regardless of code-required accessibility, whether a residence is public or private, or the current state of boomers' health, as the research reveals, most existing homes are not equipped for AIP. Ultimately, researching, planning, funding, and implementing AIP assistive devices are

the homeowner's responsibility. Equipping a home for AIP can include a wide range of architectural devices and products. Upgrades, however, cannot be incorporated with a "one size fits all" mentality. They must be tailored to the specific needs of the individual. This is the reason expert-recommended AIP checklists include an exhaustive list of suggested assistive devices.

This section reviews current research on AIP assistive devices. It includes studies specifically on the willingness of boomers to adopt AIP assistive devices in residences, findings reported from architects on AIP devices incorporated in residential projects, and the state of existing residences. Combined within the AIP upgrade research are general or lifestyle renovations that have AIP characteristics. Most all of the devices in the review of research are found on an expert-recommended AIP Assistive Device Checklist for upgrading homes. However, not all devices found on an AIP checklist were represented in what was found. This review divides AIP upgrades into technological, architectural, and ancillary AIP assistive devices. A table with the AIP assistive devices found in current research is available in Appendix B, and the general or lifestyle renovations are found in Appendix A.

Technological AIP assistive devices. Research indicates boomers are more interested in technological AIP upgrades, rather than architectural, especially technology they are familiar with and use on a daily basis (Philips, 2014a). However, 48% of boomers are not planning on implementing any smart technology (Philips, 2014b). Of those not planning for technology upgrades, 23% stated they did not know where to start, 25% were not interested in upgrading, and 42% cited the cost of technology as a barrier (Philips, 2014b). Yet boomers continually prove they have no fear of technology and continue to adopt as actively as younger users

(O'Conner, 2014; Pew Research Center, 2014). This section explores the technological AIP assistive devices boomers have adopted and those they desire for AIP.

Research conducted by Ahn et al. (2008) surveyed 1,546 alumni of a southern university aged 55 years and older on their willingness to adopt assistive technologies (see Appendix B). The 25 items surveyed and boomer interest were 98% microwave ovens, 90% CD players, 93% VHS players, 88% cellular phones, 74% DVD players, 70% remote garage door openers, 52% fax machine, 49% laptop computer, 32% burglar alarm, 27% satellite TV, 26% personal digital assistant (PDAs), 21% gas leak detector alarm, 19% home theater system, 18% remote controls for temperature or humidity, 16% remote controls for on/off of lights or dimming, 16% personal health diagnostic system, 2% flood alarm, 2% emergency alert product, 1% remote control for home appliances, 0.5% remote control for raising/ lowering shutters, 0.5% video phone, 0.5% video phone at entrance, 2% wireless health monitoring product, 0% video recognition door opener, and 0% electronic toothbrushes (Ahn et al.). This study educated participants with a provided list of AIP assistive devices, yet 80% of the respondents said they had prior knowledge of video phones and emergency alert products. However, it is not known if respondents had prior knowledge of these devices specifically as being AIP assistive features. Technology least familiar to participants were flood alarms, personal health remote diagnostic products, video-recognition door openers, and remote diagnostic products (Ahn et al.). While Ahn et al. included high technology products for AIP, architectural devices were not examined in this study. Also, some of these technologies are now obsolete.

A study conducted by health product manufacturer Philips and Georgetown University's Global Social Enterprise Initiative (2014a, 2014b, 2014c) used an online survey of 1,000 Americans to determine their incorporation plans for smart home technologies among two

groups: boomers aged 50 to 80 and residential and commercial contractors. Results included a willingness of boomers to adopt familiar assistive technology such as stovetops or ovens with automatic shutoff (58%), a single remote to control and manage the home (46%), automated thermostats (50%), security alarms (53%), high speed Internet (63%), and WiFi (49%; Philips; see Appendix B). This research published results of very few technological devices and the format for collecting this data is unknown.

Contractors' opinions on the adoption of smart assistive technology in boomer homes were sought in the Philips and Georgetown study because of their role as AIP stakeholders in shaping residential environments (Philips, 2014b). Contractors' reasoning for not currently incorporating smart devices into new construction include fear of obsolescence and a lessened likelihood of current elderly – those older than boomers – using smart technology beyond a smart phone in their homes (Philips, 2014b). Contractor's forecast for increased demand of AIP home technology is 10 to 15 years from now (Philips, 2014b).

Merrill Lynch conducted a series of studies exploring boomer life priorities utilizing a total of 5,983 respondents (Merrill Lynch, 2014). One focus was on AIP home readiness. This series of studies found boomers were interested in the following: 80% in home expenses reduction through smart thermostats or apps to control appliances; 76% to optimize health via sensors, alerts, or medication reminders; 67% air purification systems for health and to improve sleep; and 58% in automated home maintenance technologies such as cleaning robots or heated driveways (Merrill Lynch, 2014; see Appendix B). Again, this research published results of very few technological devices and the format for collecting this data is unknown.

Findings from studies using architectural client data revealed a high interest level in some standard types of system upgrades and appliances that could also be considered AIP

features. They include wireless systems (63%), energy management (53%), back-up power (48%), long range controls (50%), security systems (37%), smart thermostats (60%), and Energy Star® products (47%; Baker, 2014b; see Appendix A).

Architectural AIP assistive devices. The Center for Universal Design (2006) is a national leader in research, information, and technical assistance in evaluating, promoting and developing accessible environments. As experts, they are one of many agencies establishing accessibility standards. In 2006, the organization created a publication aimed at rehabilitating older homes for the elderly or those with disabilities. The publication included a prioritized list of 14 AIP features (see Appendix C). The features are categorized by areas within and around the home such as entrances, general interior, kitchens, and bathrooms. They are ranked by importance with no-step entrances, wheelchair accessible entries, wider doorways, and accessible maneuvering space in kitchens and bathrooms indicated as a top priority with a number 1. Important features are ranked with the number 2 and include such features as minimum width halls, maneuvering space at doors, additional electrical outlets for lighting and alert devices, adaptable kitchen and bath counters that accommodate knee space at sinks and work surfaces, wall blocking for grab bars, accessible toilet, and a walk or roll-in shower stall. Lastly, offset tub or shower controls are ranked with a priority of 3 as a feature that increases safety. An innate AIP feature within this list, but not included, is single-level living. Without it, wheelchair access is not possible to the listed areas or features. Therefore, this feature was added to the list. The Center for Universal Design suggests inclusion of these features within residences to achieve a minimum level of accessibility, especially if the area is being upgraded with lifestyle improvements. The Center for Universal Design advises incorporation of these core features even if exact dimensions cannot be achieved. Note the assistive devices in this list are built-in

architectural features, not technological. The Priority Features could be thought of as a basis for AIP device knowledge. Therefore, it will be used in this study as a tool for comparison to individual participant pre-test knowledge of AIP assistive devices.

Also used for comparison are the five AIP features currently found in 1% of U.S. housing (see Appendix D). The five features are built-in devices, not technological products, and include no-step entry, single-floor living, extra-wide doorways and halls, accessible electrical controls and switches, and lever-style door and faucet handles (JCHS, 2014a). The same study found nearly 90% of existing homes have at least one of the five AIP features, and only 57% have more than one (JCHS, 2014a).

The following reveals research found on specific AIP features including no-step entries, single-level living, kitchens and baths, vertical access and additional features. No-step entries were mentioned frequently as an important AIP feature (see Appendix B). The Joint Center for Housing studies found them existing in 42% of homes in 2014 and 44.9% in 2015 (JCHS, 2015). Of architectural clients incorporating AIP features, 55% were increasing exterior and interior access (Baker, 2014a). No-step entries can be found in higher percentages based on regional geography within the country. In the South and the West nearly 50% of homes have no-step entries (JCHS, 2015). The Midwest and Northeast comprise less than 33% of the homes with no-step entries (JCHS, 2015). When comparing newer and older homes, 52% of residences built after 2000 had no-step entries versus 24% of older homes (JCHS, 2014a).

The goal of single-level living is to locate all necessary functions on one living level. Single-level living was found to exist in 76% of housing nationwide and in 84% of southern homes (JCHS, 2014a). Those renovating or modifying to accommodate single-level living accounted for 15% from one source (Merrill Lynch, 2014), yet architects reported 47% of

residential clients incorporating this feature (Baker, 2014a). Additionally, 7% of boomers were found to be incorporating a ramp, lift, or elevator to aid in single-floor living (Merrill Lynch, 2014) and 0.5% were incorporating in-home elevators (JCHS, 2015). Single-level living can be found more often in multi-family, multi-story residences built after 2000 (JCHS, 2014a) with incorporated features such as an elevator or a platform lift (ICC, 2012b). A recent Joint Center for Housing study found 61.3% of homes of those aged 55 and older had no steps between rooms (JCHS, 2015). Rooms required to make single-level living possible include a bedroom, full bath, kitchen, and laundry. Nationwide, over 75% of homes have a bedroom with a full bath on the main floor at the entry level (JCHS, 2015). Homes with bedrooms and baths on the main floor include 84% in the South, 81% in the West, 72% in the Midwest, and 57% in the Northeast (JCHS, 2015). Finally, 54% of boomers are willing to adopt master bedroom and baths on the first floor to accommodate single-level living (Philips, 2014a, 2014b).

The incorporation of assistive features into kitchens and bathrooms has been proven vital to AIP due to higher rates of fall risk and injury. Data reported by architects shows a greater interest in accessibility features for both areas that grows every year. In 2012 54% of clients were interested in accessible bathrooms and 35% in kitchens (Baker, 2012). According to AIA chief economist Kermit Baker (2012), bathrooms are the first spaces to be upgraded in existing homes with reasoning focused on AIP. Popular products among AIA clients included door-less or no-threshold showers (60%) and hand-held showers (33%; Baker, 2012). As mentioned prior, grab bars are highlighted as an important safety feature in and around the tub or shower and toilet (Stevens et al., 2011). A study surveying all U.S. residential settings reported 19% of homes had grab bars (Stevens et al.). This study, however, included all senior housing types (private residences, nursing homes, and assisted living facilities) accounting for a higher

percentage of grab bars than what is currently found in private residences. More recent studies include one by Merrill Lynch (2014) who found 28% of boomers implementing safety features such as handrails, grab bars, and walk-in showers. Another study by product manufacturer Philips and Georgetown University's Global Social Enterprise Initiative (2014a, 2014b, 2014c) found 48% of boomers willing to adopt bathroom handrails (Philips, 2014a, 2014b). Finally, the Joint Center for Housing reported 42.1% of U.S. housing with wheelchair accessible bathrooms (JCHS, 2015).

Kitchen remodels are among the costliest to engage in (JCHS, 2014a), yet, many homeowners undertake it without considering AIP. However, the Joint Center for Housing reported 32.3% of U.S. housing has wheelchair accessible kitchens (JCHS, 2015). Also, 35% of architectural clients were found to have incorporated AIP features into kitchen design (Baker, 2012). Also, AIP kitchen upgrades often include appliance upgrades. Lastly, 5% of boomers have installed pull-up counter space in the kitchen (Merrill Lynch, 2014).

Lever style handles on doors and faucets are AIP Checklist items that help with dexterity issues caused by physical deformation or arthritis. Research revealed nationwide that levers were found in only 8% of residences (JCHS, 2014a). According to the Joint Center for Housing, lever style door handles were present in 20% of newer residences built after 2000 versus 4% in older residences (JCHS, 2014a). Based on geographic region, lever-style handles on doors and faucets are as follows: 6.5% Northeast, 8.6% Midwest, 6.9% South, and 12% West (JCHS, 2014a).

Extra-wide doorways and halls to accommodate wheelchairs or assistive walking devices were the AIP features found least often (10.2%) in the Joint Center for Housing studies (JCHS, 2015). Based on region, extra-wide doorways and halls are as follows: 7.3% Northeast, 8.2%

Midwest, 7.8% South, and 8.3% West (JCHS, 2014a). In newer homes built after 2000, extra-wide doorways were found in 16% of newer homes versus 7% of older homes (JCHS, 2014a).

Access to electrical controls and system upgrades are considered as AIP planning. Accessibility to electrical controls was found in 44% of homes nationwide (JCHS, 2014a). Based on region, accessible electrical controls are as follows: 37% Northeast, 49.2% Midwest, 41.8% South, and 48.7% West (JCHS, 2014a). System upgrades such as electrical, mechanical, and plumbing were important to 15.7% of renovating consumers in 2015 (JCHS, 2015). System upgrades also offer safety and energy efficiency for AIP. One study found 54% of boomers willing to incorporate more effective lighting throughout the house (Philips, 2014b) and another revealed over 90% changing to LED lighting (Baker, 2014a). Of architectural clients, 36% incorporated exterior and safety lighting (Baker, 2014b). Lighting upgrades help with both increased illumination levels and energy efficiency needed for AIP. Other general upgrades for systems found in research on architectural projects that align with AIP initiatives included 48% of clients upgrading with tankless water heaters (Baker, 2014a), and 48% planning for emergencies with backup power (Baker, 2014b).

Exterior upgrades are important to AIP because they maintenance and increase access and safety. General upgrades such as roofing, siding, windows, and exterior doors accounted for 20.3% of boomer expenditures, as well as 13.7% of property improvements, including addition of detached garages and work on driveways, walkways, patios, and terraces (JCHS, 2015). Exterior energy efficient upgrades were important to 58% of architectural clients with 65% installing attic insulation and 58% triple glaze windows (Baker, 2014a). Upgrades specifically intended for AIP included 60% implementing low irrigation landscaping (Baker, 2014a), 70%

remote garage door openers (Ahn et al., 2008), and 58% low-maintenance exteriors (Philips, 2014b).

Multifamily properties with more than 10 units were shown to have more accessibility features than single family homes. Research revealed multiple accessibility features in these residences, such as ramps, elevators, and units with single-floor living (JCHS, 2014a). Conversely, apartments in multifamily buildings with less than 10 units and attached single-family units have the fewest multiple accessibility features (JCHS, 2014a).

Finally, due to the inevitably of age related physical decline, research was sought on fitness upgrades to assist boomers with AIP. Creating places and opportunity to be physically active have been shown to increase the likelihood of an individual engaging in physical activity (Health.gov, 2015). Based on this premise, having a dedicated or non-dedicated area within or in close proximity to the home might make exercising more convenient and thereby increase the likelihood of fitness activities. In one general renovations study, 8% of clients implemented an exercise room or area within the home (Baker, 2014b). No other studies were found on intent to incorporate or existing fitness upgrades for the AIP home. Because of the importance of fitness to AIP and a lack of data on the topic, this current research included items pertaining to this category within the survey.

Ancillary AIP assistive devices. Very few studies on adoption or interest in ancillary AIP assistive devices were found. For this study, ancillary AIP devices are those that are not technological or architectural in nature, but are low-technology solutions that provide assistance or safety such as can openers, shoe horns, anti-slip tape for treads or easily operable window coverings. A study surveying all U.S. residential settings reported 63% of homes utilized bathtub mats or nonskid strips on the tub floor (Stevens et al., 2011). The importance of ancillary AIP

devices cannot be understated in equipping a home for AIP; therefore, some devices were included in the survey. Ancillary devices were limited, however, to lessen the likelihood of possible participant attrition.

Research on Possible Stigma Toward AIP Assistive Devices

The literature has revealed a majority of boomers aesthetically renovating areas in the home that correspond to areas experts recommended for AIP upgrades. Also discovered were some boomers who do not know where to start with technology upgrades and a majority of boomers with no interest in AIP assistive upgrades. Could a lack of education on AIP assistive devices and possible stigma toward AIP devices be to blame? This section will reveal research on boomers' stigma and explore current educational endeavors focused on reducing stigma related to AIP assistive devices.

Stigma toward AIP assistive devices may be one of the reasons boomers are reluctant to upgrade their homes for AIP. Users attach stigma to products that evoke negative feelings in themselves and others during interaction (Vaes et al., 2012). This can affect the user's self-esteem and emotional well-being (Vaes et al., 2012). Therefore, to limit negative feelings, users take action by rejecting those products (Vaes et al., 2012). Boomers may be rejecting residential assistive devices because they associate them with disability and old age.

Health-related stigma toward old age and disability persists due to deep historic roots tied to negative imagery, language, and stereotypes associated with incapacity (Ingstad, & Whyte, 1995; WHO, 2011; Yazbeck, McVilly, & Parmenter, 2004). This idea of old age as a cultural problem was sustained by societal views and healthcare models throughout the 20th century and still persists in the 21st (Barnhart & Peñaloza, 2013). Marketing and advertising continues to

promote negative stereotypes by portraying the elderly as old, frail, and uninformed (Wallis, 2014).

Health-related stigma is slowly changing due to boomers reinventing aging through economic and demographic empowerment (Barnhart & Peñaloza, 2013). Boomers account for about half of all consumer spending and their purchasing power has the ability to shape markets and attitudes (Wallis, 2014). As a generation, they reject anything that might associate them with disability, getting old, and being dependent (Barnhart & Peñaloza). To the detriment of advertisers, over half of the 50-plus demographic ignore demeaning advertisements (Wallis). Conversely, rejection has the opposite effect of backfiring on boomers. When faced with knowing their market demographic is between 47 and 70, companies will not market to an older demographic for fear of appearing old (Wallis).

The presence of AIP assistive devices could be considered a visible stigma (Skogsrød, 2015; Vaes, et al., 2012). Visible stigma evokes a response and confronts prejudices by inspiring pity from others (Skogsrød, 2015; Vaes, et al., 2012). Like most, boomers have the desire to be portrayed as normal. Since the residence is a place where one feels protected from others' perspectives and influence, it is the last place one would want to be portrayed as or be reminded they are helpless. The visual display of AIP assistive devices might reveal boomers as vulnerable and dependent. For older adults, asking for help can be interpreted as a threat to their independence and an indicator that they are no longer as capable as they once were (Barnhart & Peñaloza, 2013). In U.S. culture, this threat is particularly acute where individualism, independence, and self-reliance are highly valued (Barnhart & Peñaloza, 2013). Visible AIP assistive devices may convey this same message.

In a boomerang effect, by rejecting AIP assistive devices, boomers may be perpetuating stigma toward getting old (Barnhart & Peñaloza, 2013) and ensuring their dependence on others. The negative way in which they reject shows a lack of understanding that most AIP assistive devices are standard features with AIP characteristics. Since most AIP devices are standard, this suggests boomers have stigma toward certain AIP assistive devices, and are generalizing that stigma to all AIP features. Rejection of AIP features also has the result of increased product stigmatization and companies' unwillingness to associate by marketing to boomers (Barnhart & Peñaloza, 2013).

This research also explored familiarity and possible stigma toward the term *aging in place*. No research was available on boomers' familiarity with term. As the World Health Organization revealed, a lack of knowledge and language can promote stigma (WHO, 2011). This current research suggests some boomers may associate stigma toward the term *aging in place* since it aligns itself with terms already defined as those that signify the latter stages of life such as *empty nest* (Barnhart & Peñaloza, 2013) or *shut-in*. This research tested these assumptions of a lack of education and associated stigma toward AIP assistive devices and the term *aging in place*.

Considerations for Educating Boomers

This research used education as a means to influence participant awareness of and possible stigma toward AIP assistive features and upgrades. It also used participant-created prototypes focusing on AIP assistive device education as instrumentation to understand the types of instructional design boomers would more readily accept. Therefore, an understanding of current literature using AIP upgrade education as a research stimulus and information contributing toward a boomer learner analysis was explored.

AIP upgrade education delivered as a stimulus. AIP upgrade and assistive device educational stimuli used in research may possibly be inhibiting education and contributing to stigma. Prior research examined in this study used a truncated list of AIP assistive devices that did not have a true-to-life ratio of architectural to technological assistive devices and some had a disproportionate ratio of non-stigmatized to possible stigmatized devices. The Ahn et al. (2008) study had 25 AIP technological assistive devices with no architectural devices. The Pew Research Center (2014) provided results on six technological devices with a focus on Internet and phone usage. Complicated technological devices could be stigmatized by older adults due to their difficulty of use. Merrill Lynch (2014) published results on five architectural built-in features and five technological devices, five of which had possible stigma. Phillips (Philips, 2014a, 2014b) published results on ten devices with equivalent quantities of architectural and technological devices, one of which had possible stigma. Finally, the Joint Center's housing studies (JCHS, 2014a, 2014b, 2015) focused on architectural assistive features, as did the American Institute of Architects (Baker, 2012, 2014a, 2014b). The Joint Center focused on twelve AIP features with three having possible stigma. The Institute of Architects published results for thirteen AIP features with four having possible stigma. Lastly, the number and type of assistive devices participants were educated on to decrease fall risk in the Stevens study is unknown (Stevens et al., 2014).

Expert AIP checklists are predominantly composed of non-stigmatized, built-in architectural features (NAHB, 2015). The list goes beyond areas one would typify in need of upgrade, such as the bathroom, and extends to exterior areas such as garages, and walkways. It also comprehensively specifies details such as door and cabinet hardware, flooring specifications, and measurements.

The residential assistive features found in the reviewed literature formed the basis for the AIP Assistive Device Checklist (see Appendix J) used as the educational stimulus and survey instrumentation in this current research. The features used in the AIP Checklist included assistive devices, products, and architectural upgrades required in HUD housing, devices represented in other studies, and checklists used by certified AIP specialists. The checklist is expanded, yet is not inclusive of all possible AIP assistive technology, architectural, or manufactured devices. Assistive devices in the list are portrayed using a detailed description of an item or system. Proprietary names are avoided, except in the case of some technologies that might only be recognized by name. Items are listed singularly and in components that work together to make a system. An example of a singular item in the list is a "therapeutic bathtub with a door". An example of a system is "a covered, accessible entry area with a wider doorway, beveled threshold, and a surface for packages". The reasoning behind system descriptions is that the components as a whole make a fully accessible AIP feature and leaving out of one of the items would lessen or negate accessibility.

This is the first study to implement five aspects of an actual expert-recommended AIP checklist within a research stimulus: first, a longer, more comprehensive checklist of 33 features or devices; second, a larger ratio of architectural to technological AIP devices; third, a greater percentage of standard products or features compared to elderly or disability specific products; fourth, more non-stigmatized devices than possibly stigmatized; and fifth, simple and precise terminology to describe assistive devices.

The AIP Assistive Device Checklist was purposively structured in this manner for several reasons. A longer list of devices was intended to make boomers aware of a broader range of AIP assistive devices. The purpose for including upgrades that are not traditional universal,

accessibility, and elderly or disability specific features was to influence possible stigma and to educate participants that AIP features can be found from standard features or products. It was also intended to help boomer participants realize AIP upgrades could unnoticeably be incorporated and thereby avoid possible stigma. Further reason for structuring it in this manner was to impress the need for phased implementation of AIP features, since most are built-in or attached architectural features versus mobile or temporarily. Further, identifying and separating AIP assistive devices based on stigmatization could bring about the realization that non-stigmatized standard products can be implemented earlier without, or with a lessened effect of, visible stigma, with stigmatized products then implemented in the latter AIP phases. Finally, the reason for keeping terminology simple yet precise was to increase lay-person comprehension and awareness of the correct technical terms for AIP assistive devices.

Boomer learner analysis. A first step in creating any instructional design is understanding more about the learner. This process is called learner analysis. A learner analysis seeks to understand the target population's entry skills, prior topic knowledge, attitudes toward the content, academic motivation, general learning preferences and potential delivery systems, attitudes toward the organization creating and providing instruction, and group characteristics (Dick, Carey, & Carey, 2015). Thus far the literature review has provided an understanding of boomers' prior topic knowledge, attitudes toward the content, academic motivation, and group characteristics. This section provides further information found in the literature on boomer group characteristics, attitudes toward the organization creating and providing instruction, general learning preferences, and potential delivery systems.

Group Characteristics. Boomers are a diversified generation. As a population, they are divided into three groups: older boomers born between 1946 to 1951, middle boomers born

between 1952 to 1958, and younger boomers born between 1959 to 1964 (MetLife, 2013). Due to their large age span (52 to 70 in 2016), their educational needs as a group might not typify their sub-generational desires for the way they want to learn about AIP assistive devices. Sub-generational ideals may also play a part in how they perceive stigmatized assistive devices.

Another concern influencing AIP upgrades and learning is a rise in immigrant boomers. Current increases in boomer population have been fueled by immigration, with the younger boomer sub-set diversifying the most with 13% Hispanic, 4% Non-Hispanic, and 2% Asian and other races (MetLife, 2013). With current estimates, immigrant boomer population growth by 2030 is estimated to be 30% for younger to middle boomers and 23% for older boomers (JCHS, 2014a). Increases in immigrant boomers may lead to a subset of low-income boomers who cannot afford current housing, assisted care, (JCHS, 2014a), or AIP assistive upgrades. Immigrant knowledge on AIP assistive devices also is not known, but is not addressed in this study. Nevertheless, if we currently don't know how to educate native born boomers on AIP, how will we educate immigrants? All of these factors should be considered when creating the instructional design for AIP assistive devices.

Attitudes toward potential organizations creating and providing instruction. The organizations that create instructional design must be accepted and trusted by the learner. Consumer education comes from many different accepted sources such as the government, academia, professionals, the environment, manufacturers, and marketing, to name a few. To change awareness and stigma, the World Health Organization and World Bank (2011) support legislation, policy changes, capacity building, technological developments to increase accessibility in environments, and access to better health, education, rehabilitation, and support services as effective measures. Interventions for product stigma should also target attitudes and

beliefs or change the balance of power that gives dominant groups the ability to act on their attitudes and beliefs (Link & Phelan, 2001; Vaes et al., 2012). Tactics proven to alleviate stigma toward disability are educational social marketing and community-based rehabilitation. The World Psychiatric Association used information campaigns in a ten year intervention to fight stigmatization of schizophrenia (WHO, 2011). The results were an increase in the general knowledge on psychosis and earlier intervention that led to a decrease in the duration of untreated psychosis (Joa, et al., 2007; WHO, 2011). Also, a three-year community-based rehabilitation program in India resulted in disabled children attending school for the first time, encouraged more individuals with disabilities to participate in community forums, and increased vaccination and rehabilitation practices among parents with disabled children (WHO).

Product manufacturers could be key contributors in the AIP assistive device educational process. When changes or stigmatized products must be integrated into public life, government funded campaigns or interventions have proven successful at educating and changing pubic views (Vaes et al., 2012). Further, legislation and tax incentives have proven successful in the Energy Star® program. Energy Star® was created by the U.S. Environmental Protection Agency (EPA) as a voluntary program to help businesses and individuals save money and reduce energy usage through products, homes, commercial buildings, and industry plants that use less energy (Energy Star, 2015). Established as legislation in 1992, the initiative received government backed funding for research, evaluation, strategy building, and marketing to structure the program (Energy Star). Energy efficiency education and incentives have been so successful that in 2013 they occupied first place in mid-sized market spending for homeowners of all age groups (JCHS, 2015).

Potential general learning preferences. It is important to understand from whom or what boomers wish to learn about AIP upgrades. Literature reveals the preference for learning about ongoing living assistance for 45% of those aged 40 and older is from social circles or peer groups (AP-NORC, 2014). Ongoing living assistive and AIP upgrades are connected in that living assistance depends upon caregiving and the assistive devices that help in that effort. Dependence on others for learning is supported again with 70% of those aged 40 and older who think they will be able to avoid long-term care planning and costs by relying on family to do it for them (AP-NORC). Further, 57% place the responsibility of their ongoing living assistance on someone else (AP-NORC). This creates the idea that AIP education and planning is the caregiver's responsibility. This in turn fosters a lack of AIP upgrade activity. Dependence on another to provide AIP planning has proven unrealistic. Family members who have cared for a member or a close friend on a regular basis account for 53% of those aged 40 and older, yet 67% of long-term care providers know from experience and do not feel family can be counted on for their own future care (AP-NORC). Dependence on social circles for information on long-term care planning might be the most used resource, but it may also disseminate information that is unreliable, inaccurate, too little, and stigmatized. Therefore, if boomers want to AIP safely and successfully, they must take the responsibility of education and planning upon themselves.

Expert advice is perceived as the most reliable source for information on ongoing living assistance (AP-NORC, 2014). However, not every boomer is going to seek advice on AIP upgrades. Of those aged 40 and older, 20% have not sought information on aging issues and ongoing living assistance (AP-NORC, 2014). Even if boomers receive expert advice it is not guaranteed AIP upgrade compliance will occur. Of those who used architectural services in 2014, 35% chose not to incorporate in-home AIP features (Baker, 2014a). Experts themselves

know AIP upgrade advice is steeped in consumer stigma and that boomers are averse to implementing AIP assistive devices. An American Society for Interior Designers [ASID] (n.d.) Toolkit on AIP recognizes this and suggests not using the term *aging in place* in marketing, recommending the use of divertive labeling when suggesting devices and furtively offering standard options with AIP characteristics along with clients preferences for feature selections (ASID).

From the literature, an example of expert-delivered AIP upgrade education was found for reducing fall risks (Stevens et al., 2014). The study used education as a means to influence the frequency of falls in older adults in test and control group participants (Stevens, et al., 2014). Participants were community-dwelling adults aged 65 years and older who lived independently, and were at high risk for falls. The test group received educational intervention from a trained expert consisting of an in-home fall assessment with recommendations for AIP home and environmental changes along with additional healthcare (Stevens et al.). The control group received home safety educational pamphlets and usual care (Stevens et al.). The study did not document whether participants incorporated AIP assistive devices; however, the results showed that injury severity differed by participant status with the test group sustaining 44.8% of all falls and 56.2% of the moderate or severe injuries. The control group sustained 55.2% of all falls and 43.8% of moderate or severe injuries. These differences were statistically significant (chi square $p = .01$), and educational intervention was not shown to have any influence of protective effect in the test group (Stevens et al.). However, in-home safety intervention using expert occupational therapists have been successful in reducing falls in prior studies through assessments and educational interventions such as home modification and prescribed progressive exercise programs (Stevens, 2010).

Potential delivery systems. Due to the ineffectiveness and absence of current educational instruction, how boomers would like and are able to receive education is also an important topic of exploration in this research. This section explores existing and potentially successful means of educating boomers based upon their technology comfort level and usage specifically to increase health education.

Research on boomers' and the silent generation's comfort level for using the Internet provides an argument that computers, smart phones, and tablets would currently be an appropriate media for delivering AIP upgrade education for most younger and middle boomers. Younger and middle boomers are active technology users, yet older boomers still have lower, but growing usage (Pew Research Center, 2014). The percentage of younger and middle boomers aged 50 to 64 who have adopted and use computers (84%) and the Internet (88%) is comparable and catching up to that of those aged 18 to 29 (Pew Research Center, 2014). The number of computer users declines sharply for older boomers, however, with 56% using computers and 57% using the Internet (Pew Research Center, 2014).

Some boomers may become their own AIP experts through self-education via the Internet. Boomer consumers have been known to research their own health, with one study revealing 78% searching the Internet (Smith, 2015) and another study reporting 84.5% of those aged 46 to 64 using websites and 59.7% of those aged 64 and over (Pai, 2014). This creates concern for boomers conducting searches who are unaware of assistive devices and AIP technical terms. A study exploring the educational disconnect between medical terminology used by healthcare professionals and consumers reveals that most times people possess topic knowledge (Zielstorff, 2003), but do not know the correct terminology. This disconnect in medical terminology has proven to be a barrier in accessing relevant information via Internet

searches for healthcare information (Zielstorff). This may also be the case for AIP. Almost all expert-authored AIP Internet and print resources preface their work by providing the term and the definition for AIP. Experts must have reason for doing this, but research was not found on consumers' knowledge of the term *aging in place*. A proposed solution for mismatched medical terminology in the Zielstorff research was to facilitate education via a terminology server that accommodates the language consumers use and understand. This current research asserted that most laymen do not have a familiarity with technical terminology associated with AIP, but understand the concept. This study explored participants' knowledge of the term *aging in place* and asked boomers to list the synonymous terms they use.

Smartphones are also a potential delivery system. The number of smart phone users for those aged 50 to 64 in 2015 was 54% and those aged 65 and older 27% (Pew Research Center, 2014). This amounts to nearly half of the population of younger and middle boomers and a little less than 75% of the older boomer population not using smartphones. Research suggests, however, that boomer comfort levels with smart phone technology is on the rise. In a 2015 Pew Research Center study on smartphones, it was found usage had increased for all age groups 18 and older (Smith, 2015). Smartphone adoption is not totally reflective of comfort level. Other factors such as expense and area coverage should be considered as reasons for slow adoption. Research revealed 39% of boomers in one study were using smartphones to educate themselves on health issues (Smith, 2015). Another study revealed boomers favored smartphones as a means to educate themselves on health issues, with 86% of those aged 46 to 64 and 78.4% of those aged 64 and over preferring smartphones (Pai, 2014).

Other possible forms for delivery systems were revealed in a study looking for methods to help consumers educate themselves on better managing their health. The study was conducted

by researchers from Saint Louis University, Northern Arizona University, and George Mason University with 469 consumers, 258 of which were baby boomers, (Pai, 2014). Of boomer groups aged 46 to 64 and 64 and over, respectively, it was found that 81% and 57.6 preferred email, 52.5% and 37.4% call centers, 49.6% and 25.9% video conferencing, 49.6% and 20.1% texting, 36.8% and 20.9% podcast, 35.3% and 23.7% kiosk, 28.7% and 18.7% blog, and 21.3% and 14.4% Wiki (Pai). The value of printed media, mailed or handed out, cannot be forgotten. Printed media would provide the nearly 45% of older boomer non-computer users and a little less than 75% of non-smartphone users access to AIP resources (Smith, 2015).

Increasing product visibility through marketing on TV, magazines, publicity, social media, or other product endorsement has proven to be an effective delivery system for educating consumers and reducing stigma. Product visibility, or the social image of a specific product, is effective in influencing people's language or shared beliefs (Vaes et al., 2012). The language people use to describe products creates a visual image that remains in the minds of users and with the product (Vaes et al., 2012). Changing the language in a positive way increases the likelihood of a products success (Vaes et al., 2012). Also, increasing a product's presence through influential media figures or political agencies can greatly impact product acceptance (Vaes et al., 2012).

Lastly, education can be delivered by a more subtle means such as a product label. Energy Star® is such a widely accepted and successful organization for creating and providing instruction on energy efficiency that its product label has become synonymous with the movement. The symbol is so successful that more than 85% of Americans recognize the Energy Star label (Energy Star, 2015). In essence, the symbol acts as an educational delivery system identifying energy efficient products. Similar voluntary product labeling exists with the same

educational intention such as age appropriateness, Good Housekeeping®, Underwriters Laboratory®, and parental advisories. If a similar government sponsored or voluntary industry labeling program were to target standard products with AIP characteristics, widespread AIP education and renovation without the possible negative influence of stigma might occur.

Chapter 3: Methodology

Research Design

This mixed-methods experimental study used traditional methods and design thinking strategies (DTS) to collect data. Design thinking has been used to study stigma on personal assistive devices (Skogsrød, 2015; Vaes, 2014; Vaes, et al., 2012), but had yet to be applied to AIP assistive devices. The DTS contained qualitative data gathering activities along with open-ended and closed-ended questionnaires and interviews delivered in a prescribed pre-test, stimulus, and post-test sequence. Both quantitative and qualitative methods are used as support for study findings through triangulation with qualitative methods used to add richness to the data. Within the study, the dependent variables of a lack of knowledge and possible stigma toward the term and concept of *aging in place* and residential assistive devices were explored as adoption barriers for upgrading boomer homes for AIP.

Sample

The study used a nonrandom purposive sample of 15 Caucasian younger, middle, and older boomer participants aged 52 to 70 born from 1946 to 1964. Participants were from rural East Tennessee and Western North Carolina constituting a rural sub-sample of boomers. Elderly people who live in small towns and rural areas have few AIP choices other than their current residence or a nursing home (HAC, 2014). The sample was composed of seven males and eight females. There were no health restrictions for participation, except that boomers be able to write their own responses and be involved in study activities for an extended period. Unlike most experimental studies, the sample consisted of only an experimental group.

The instruments were delivered to participants in groups of two to three with a total of seven groups. Six of the groups were composed of married couples and 80% had experience with

long-term care. Small numbers were used in an attempt to foster group participation from all members, to attain quicker group consensus, and to allow for more successful data collection from group discussions during the design thinking strategies. Another reason for using small groups was for participants to learn about AIP assistive devices both from their own social circles (the most popular source for information on elderly ongoing living assistance) and from expert advice (the most reliable source; AP-NORC, 2014). Groups consisting of stakeholders in the problem are also the prescribed means for design thinking data collection.

Participants were recruited though researcher personal contacts and word of mouth or snowball sampling. Equal representation of boomer sub-populations, gender, and ethnicity were sought, yet were unable to be located or participate within the prescribed time period. Twenty-five participants were initially contacted with 15 completing the instrumentation.

Instruments

The instruments consisted of a demographic questionnaire and four DTS. The instrumentation used both the simple experimental design process (pre-test, test or stimulus, and post-test) and the design thinking process to learn more about the problem. The design thinking process followed the five phases as defined by Stanford's Design Thinking Process Guide (Empathize, Define, Ideate, Prototype, and Test stages; Kumar, 2013). Design thinking does not necessarily follow a prescribed sequence (Kumar), therefore, the phases are represented throughout the strategies.

The DTS contained a total of 22 open-ended (OE) questions, 28 closed-ended (CE) questions, and a 33 item AIP Assistive Device Checklist (AIP Checklist) with three CE questions per device. Most of the CE questions, unless otherwise noted, used a Likert scale where 1 equaled strongly disagree and 5 equaled strongly agree. Instruments were printed and bound in a

folder for each participant that included colored sticky notes and pens. Participants were required to work both as individuals and in groups to complete the DTS. See Appendices E-K for the study instruments.

DTS-1 through DTS-3 explored the Empathize and Define stages. The Empathize stage studied boomers' feelings and needs by having them interact and engage directly with each other about their possible stigma toward AIP assistive devices and the term and concept of *aging in place* (Platner, 2010). The Define stage brought clarity and meaning to the potential problem by participants expressing what they know about the dependent variables in their own terms (Platner).

The first instrument, DTS-1 Aging in Place Questionnaire, explored individual participant pre-test and test knowledge and stigma toward the term and concept of *aging in place* (see Appendix H). Activities within DTS-1 consisted of a CE question to understand participant pre-test knowledge of the term *aging in place* (Define), a stimulus providing the definition of the term *aging in place*, CE questions on participant familiarity with the term and concept (Define), a stimulus providing the definition of *stigma*, CE questions about stigma toward the term *aging in place* (Empathize), an OE question where synonymous terms for AIP were listed (Define), and CE questions with one scale that, if checked, expressed stigma toward a synonymous term (Empathize).

DTS-2 Bulls-Eye Diagram and Questionnaire explored participant pre-test knowledge and possible stigma toward AIP devices (see Appendix I). The activities within DTS-2 were a stimulus on the difference between personal assistive devices and AIP assistive devices, a worksheet where individual participants listed the devices they were aware of in OE fashion (Define), and CE questions where listed devices were further defined using a scale of mobile or

built-in (Define), standard product or elderly/disability specific (Define), and a Likert scale defining the degree of stigma toward the device where 1 equaled no stigma and 10 equaled most stigma (Empathize). DTS-2 also contained a bulls-eye diagram that ranked the group's devices based on "no stigma", "less stigma", and "most stigma" (Empathize), and OE reflection questions that defined the reasons for the bulls-eye placements (Define). Lastly, DTS-2 established participant pre-test stigma toward AIP assistive devices using CE Likert scale questions.

DTS-3 continued the design thinking Empathize and Define stages, but was also the beginning of the Ideate stage. In the Ideate stage, participants transitioned from identifying potential problems to creating solutions (Platner, 2010) by brainstorming prototyping ideas for an educational system that would instruct boomers on upgrading for AIP. The DTS-3 AIP Assistive Device Checklist (AIP Checklist) and Questionnaire was an individual exercise (see Appendix J). It contained a stimulus on 33 expert recommended, exterior and interior, AIP assistive features. It established test knowledge through three CE questions per device that revealed associated stigma toward the device (Empathize), expressed knowledge of it being an AIP Device (Define), and the importance of sharing the device with a peer (Ideate). Further, post-test questions revealed participant reflections on the stimulus in OE questions (Empathize and Define), an overall categorization of list items using a CE scale of elderly/ disability specific or standard products (Empathize and Define), feelings about upgrading for AIP (Empathize), thoughts on the adequacy of AIP education (Define), and the participant's timeframe for device implementation based on stigmatized versus non-stigmatized AIP features using a scale of Now, 5 years, 10 years, 20 years, Never, and Other with an OE section for an explanation (Define). Finally, DTS-3 concluded with a post-test using the same CE, Likert scaled, pre-test questions

from the DTS-1 Aging in Place Questionnaire and the DTS-2 Stigma Questionnaire (Empathize and Define).

In DTS-4 the design thinking Prototype and Test stages and the experimental design post-test were conducted. The DTS-4 Educational Prototype and Evaluation engaged participants in generating a mock-up of something that could instruct boomers on upgrading for AIP (see Appendix K). Provided parameters required the mock-up to be able to easily reach, succinctly teach, provide additional resources, and have the greatest impact on boomers aged 52 to 70. The prototyping activities consisted of listing individual ideas, listing group ideas, and elaboration on the mock-up through group OE questions and their choice of medium (narrative, notes, bullet points, or rough drawings of their ideas). The DTS-4 evaluation used OE questions to assess the prototype as a group based upon the inclusion of stigmatized ideas and reason for doing so, the use of positive language to influence stigma, concentration on specific areas within the home, inclusion of phasing, and an opportunity to suggest further ideas or change the prototype.

Procedures

The design thinking strategies were conducted consecutively in a workshop setting in any location convenient for the participants such as their home or a participant selected public space. The researcher retained the use of a classroom at a local church, if needed. Instruments were completed in approximately 1 hour and 35 minutes, but to reduce the study time and to give participants an understanding of what they would be doing during the study, the Demographics and Consent Form was distributed and filled out prior to the workshop.

The workshop began with an introduction to the Purpose of the Study, and retrieval of the Consent Form and the Demographic Questionnaire (see Appendices E-G). The introduction explained the nature of the study, what the participants would be doing, and expectations for the

design thinking strategies. For one DTS, participants were informed they would need to distinguish their responses using colored sticky notes that identified them by their generational sub-group. Green sticky notes were used for older boomers (b. 1946 to 1951), yellow sticky notes for middle boomers (b. 1952 to 1958), and pink sticky notes for younger boomers (b. 1959 to 1964). Additionally, participants were asked not to skip or flip ahead since some strategies depended on not revealing specific terms or meanings until a certain point in the study. All surveys were administered in the sequence prescribed within the instruments with the researcher acting as a facilitator by reading initial instructions, indicating when participants should work as individuals or groups, monitoring progression, and answering questions in a manner that would not influence participant answers. Data collection took place during June 2016.

Internal and External Validity

A pilot study was conducted to evaluate and improve reliability and validity within instrument design, establish timing, and to establish delivery effectiveness for the intended group size. The three boomer participants were representative in gender, ethnicity, and boomer sub-populations. Due to all participants having extensive professional experience and higher education levels, however, they were not representative of participants' lower educational levels.

Specific sources of internal validity influencing this study include selection bias, maturation, testing, instrumentation, and experimental mortality (Babbie, 2011). Selection bias due to purposive sampling was a concern for this study. The researcher attempted to alleviate this problem by ensuring participants were equally represented from each boomer sub-group, gender, and race.

Maturation presented a problem due to the length and rigor of the study (Babbie, 2011). The researcher attempted to dissuade participant hesitation about participating and alleviate

study length by disclosing the study requirements via the Consent Form and having participants fill out the Demographic Questionnaire prior to the workshop. Other attempts to lessen this influence during the workshop were the incorporation of breaks and snacks.

With any experimental design the repetitive use of instrumentation can be problematic, with participants changing their post-test responses to portray themselves in a better light after they have learned the purpose of the study (Babbie, 2011). When evaluating awareness of AIP devices during the stimulus, it was assumed participants would report a greater degree of device awareness due to the list either causing them to remember prior knowledge or as Babbie (2011) suggests, with participants figuring out the purpose of the study and making themselves appear more knowledgeable. Obtaining accurate reflections of stigma toward the dependent variables was not an original concern, since the study explored stigma through various experimental stages, as individuals and groups, and with the use of different scales. Using different scales, however, brings in the question of instrumentation producing comparable results. In this study, however, the researcher simply wanted to establish if boomer participants felt stigma toward residential assistive devices and if particular features consistently were stigmatized.

Experimental mortality was a major concern, especially once participants began the prototyping and test stage. Because of this, the study was designed with sections of traditional questionnaires, prior to prototyping, to ensure some data was gathered. Additionally, some schools of thought require sketching or model building in design thinking, but researcher experience has proven most lay persons are resistant and will even refuse to create in those mediums. Therefore, creation via multiple types of medium such as narrative, notes, bullet points, or rough drawings were permitted. Lay persons are also unfamiliar and unaccustomed with the design process, especially the test phase of design, and do not feel the need or see the

point of re-addressing or changing features about their prototype. Therefore, to extract some reflective thoughts on their creation, assessment was extracted via open-ended questions.

External validity was a concern due to a lack of existing studies specifically on stigma and awareness of AIP assistive devices and the term and concept *aging in place* to use as a guide. As predicted, when testing similar questions for the term and concept *aging in place,* participant responses were predictable. For questions on device stigmatization and stigmatization as an adoption barrier, however, participant responses were not as predicted.

Chapter 4: Results

AIP Term, Concept, and Stigma

This research sought to understand boomer familiarity with the term *aging in place* and if stigma was felt toward the term and the concept. In the DTS-1 Aging in Place Questionnaire, almost half (n=7; 47%) of participants expressed familiarity with the term aging in place, yet more than half were either unsure (n=3; 20%) or knew they had never heard of the term (n=5; 33%) prior to the study. After learning the definition, n=9 or 60% felt they were familiar with the concept of aging in place. Nearly half (n=7; 47%) of the participants felt unfamiliarity with the term could hinder others from finding resources on AIP assistive devices. Additionally, most participants (n=12; 80%) have never used the term when talking to others. Participants used alternate terms or phrases to express the concept such as: "staying in the home", "avoiding the nursing home", and "doing things to stay independent". In the study post-test, all participants expressed familiarity with the term.

Most pre-test participants did not associate stigma toward the term (n=9; 60%) or concept (n=11; 73%), yet 33% (n=5) and 20% (n=3), respectively, were unsure of their feelings. After the stimulus (the definition of the term *aging in place*), 60% (n=9), again, did not feel stigma toward the term, but 20% (n=3) who were unsure in the pre-test, did feel stigma. Also, all pre-test participants with unsure feelings toward the concept changed their minds in the post-test with 87% (n=13) not feeling stigma and 13% (n=2) with stigma.

AIP Product Awareness and Stigmatization

This research sought to understand what types of devices or features individual participants and groups considered to be AIP devices, if they felt stigma toward those devices,

and their stigma classification using various scales. This was accomplished in phases using a pre-test, test, and post-test.

Individual Pre-test and Test AIP Product Awareness

Pre-test average awareness in DTS-2 revealed a minimum of 2 devices and a maximum of 18 with an average of 7 per participant. Of the 15 participants, 93% (n=14) listed 10 or fewer devices. Females knew of more AIP devices with an average of 7 (a range of 3 to 18 devices) and males 5.5 devices (a range of 2 to 9 devices). Boomer participants listed a combined total of 30 types of AIP assistive devices (see Appendix L). The devices listed most frequently during DTS-2 were ramps (n=14; 93%), grab bars (n=11; 73%), assistive toilets (n=9; 60%), walk-in showers (n=7; 47%), and handrails (n=6; 40%). See Appendix L for additional AIP device awareness.

Individual participant AIP assistive device knowledge was evaluated once again during the DTS-3 AIP Checklist test (see Appendix M). Reading from a checklist of 33 items, the stimulus revealed individual awareness of 7 to 28 devices with an average of 20. Well over half (n=9; 60%) expressed knowledge of 15 or more AIP features. Devices participants were most frequently aware of in the DTS-3 test included built-in shower seats and recliner lift chairs (n=13; 87% of participants); walk-in showers, grab bars, extra square footage in bathrooms, and single-floor living (n=12; 80%); and increased lighting levels, wider walkways and doors, and touch or lever handled plumbing fixtures (n=11; 73%). Other devices that 60% (n=9) or more participants indicated an AIP awareness of are found in Appendix M.

Individual AIP Product Stigmatization

This research was also conducted to assess individual participant pre-test, test, and post-test stigma. Every pre-test device listed by three or more participants in DTS-2 had at least one

person attribute some degree of stigma toward it. From the uncombined total devices listed (n=101), 57% (n=57) of participant responses indicated some degree of stigma (on a scale ranging from 2 as lower level of stigma to 10 as most stigma). The frequency with which participants responded as having no stigma (an answer of 1 on a scale from 1 to 10) toward a device was 44% (n=44). Additionally, 21% of responses were indicated with a lower level of stigma (ranging from 2 to 3 on a scale of 10). Pre-test devices that three or more individuals felt a greater degree of stigma toward included mobile potty chairs (n=3 out of 3; 100%), therapeutic tubs (n=3 out 3; 100%), built-in shower chairs (n=3 out 4; 75%), ramps (n=11 out of 14; 79%), and stair chair lifts (n=3 out 4; 75%; see Appendix L). Of interest were the 55% (n=6) of participants who did not feel stigma toward grab bars. Additionally, when asked to provide more detail about listed devices from closed-ended response choices, overall devices were characterized as built-in (n=75 out of 101; 75%) and elderly or disability specific (n=58 out of 101; 58%).

DTS-2 pre-test devices with the highest level of average stigma (on a scale where 1 equals no stigma and 10 equals most stigma) and listed by more than 60% (n=9) of the participants were assistive toilets (4.67), ramps (4.21), and grab bars (3.27; see Appendix K). Of interest were the additional descriptions that added to stigma of assistive toilets. Only 13% (n=2) did not have stigma toward assistive toilets, and those were built-in taller toilets. Mobile potty chairs had an awareness of 20% (n=3) but also the highest average stigma (7.3) of any device. Built-in taller toilets had an awareness of 40% (n=6) and an average stigma of 3.3.

DTS-2 pre-test devices such as assistive seating or recliner lift chairs (6.5), stair chair lifts (4.25), assistive flooring or rug removal and non-slip flooring (4.25), and built-in shower chairs (4.3), had higher levels of average stigma, but were listed by few participants (less than or equal

to n=4; 27%). Of interest were the additional descriptions that added to stigma of shower chairs. More participants listed and stigmatized built-in shower chairs (n=3; 20%/ average stigma=4.3) than mobile shower chairs (n=1; 7%/ average stigma=3).

Individual stigma was also evaluated in the stimulus (DTS-3 AIP Checklist). Device stigma was reaffirmed and additional stigmatized devices were revealed (see Appendix M). Individual participants stigmatized a range of 0 to 9 items out of 33 with an average of 3 devices stigmatized per participant. Overall, 15 out of 33 or 45% of the devices from the AIP checklist were stigmatized. In the test, ramps were indicated as having the most stigma (n=11; 73% of participants) followed by mobile shower seats (n=9; 60%), and grab bars, therapeutic tubs, and recliner lift chairs (n=6; 40%). See Appendix M for additional stigmatized devices.

Pre-test features most frequently listed first could also inadvertently reveal both participant device awareness and degree of stigma. Listed first were grab bars, ramps, and walk-in showers, respectively. In addition, ramps were also consistently listed second (see Appendix L).

Group AIP Product Awareness and Stigma

This research also sought to understand group awareness and levels of perceived stigma toward AIP devices. In the DTS-2 Bulls-Eye pre-test, combining knowledge in social circles created a group awareness of 5 to 19 devices with an average of 10.7 per group. Depending on the group, sharing increased an individual's range of knowledge anywhere from 3 to 16 devices with an average increase of 7.4 devices. See the results for group stigma from the DTS-2 Bulls-Eye Diagram in Appendix N.

Devices groups assigned most frequently as having no stigma and with greater significance include walk-in showers (mentioned and rated by five out of five groups), handrails

(by four out of six groups), wider doors (by three out of three groups), and assistive flooring (by three out of four groups; see Appendix M). Most participants felt these items were standard products or architectural devices intended for any age. Walk-in showers were significant since five out of seven groups had them as a device to assign, and all five groups assigned them as having no stigma.

Items that occurred more frequently and were classified with less stigma in groups were grab bars (four out of six groups), ramps (three out of six groups), and built-in shower chairs (two out of three groups; see Appendix M). According to some participants, devices classified with less stigma may be less attractive and intended for those with disabilities, such as grab bars. Grab bars were significant since six out of seven groups had them as a device to assign, and four groups assigned them as having less stigma. The two other groups assigned them as having no stigma.

Finally, items that occurred more frequently with a classification of most stigma were stair chair lifts (three out of four groups), mobile potty chairs (two out of two groups) and ramps (two out of six groups). Stair chair lifts were significant, since four out of seven groups had them as a device to assign, and three groups assigned them as having most stigma. Participants felt items classified with the most stigma were strictly for the disabled and visibly identified homeowners as old, disabled, or both. On average, groups assigned some level of stigma to 41% of the devices listed.

In the DTS-2 Bulls-Eye Diagram, assistive toilets, therapeutic tubs, and ramps were assigned by groups to all levels of stigma (no stigma, less stigma, and most stigma). Assistive toilets were assigned to different stigma levels based on significant device characteristics. All seven groups had assistive toilets as a device to assign a level of stigma to. Taller fixed toilets

were assigned more frequently to no stigma (two out of five groups) and less stigma (two out of five groups), and mobile potty chairs were assigned only to most stigma (two out of two groups).

Stigmatized Devices as Adoption Barriers

This research also sought to understand if and how stigma frames boomers' perceptions of AIP assistive devices and if stigma has influenced boomers' AIP upgrading activities. This was accomplished through use of the same pre-test, stimulus, and a post-test instrumentation. In the pre-test, over half (n=8 out of 15; 53%) of the participants felt the presence of assistive devices in the home indicated disability, helplessness, or getting old, but 47% (n=7) disagreed. A differing result appeared in the post-test, however, with 53% (n=8) who had decided having AIP devices in the home was not indication of being old, 33% (n=5) who still believed it was, and 13% (n=2) who were unsure. Also, 53% of post-test participants felt AIP assistive devices designated specifically for the elderly or disabled are quickly implemented, mobile or temporary, and imply disability, helplessness, and getting old. This supports the idea that some residential AIP devices, due to their characteristics, are a source of visible stigma and, for some, those characteristics are an adoption barrier. Yet when asked specifically if stigma towards AIP devices has kept them from upgrading for AIP, 87% of pre-test and 100% of post-test participants disagreed.

Pre-test and test evidence revealed not all AIP devices have stigma (see Appendix M). Most post-test participants (n=14; 93%) felt AIP devices designated for anyone are well planned, built-in or permanent, and do not imply disability, helplessness, and getting old. Also, pre-test (n=12; 80%) and post-test (n=11; 73%) participants acknowledged that AIP assistive devices were not exclusively for the elderly or disabled. When asked in the post-test to categorize the predominant number of devices in the AIP Checklist, 93% (n=14) of participants classified them

as standard products with AIP characteristics designated for anyone over products designated specifically for the elderly or disabled.

All pre-test participants felt safety within the home was important and most (n=14; 93%) felt installation of AIP assistive devices makes homes safe. As prior research suggested, appearing not to be elderly or disabled was important to some (n=7; 47%), but 40% (n=6) did not feel that way, and 13% (n=2) were unsure. Yet when home safety was weighed against appearing not be old, all participants felt safety was more important than appearances.

Education's Influence on AIP Product Awareness, Stigma, and Upgrade Activity

This study used an educational stimulus via an AIP checklist to increase awareness and evaluate and influence possible stigma toward AIP devices. Overall, education was successful in increasing AIP feature awareness, but results for stigma were inconclusive.

Awareness

Due to the stimulus, results for awareness show an increase in knowledge or refamiliarization per device and overall. Individual and group average awareness more than doubled from 7 individual devices and 10.7 group features to an expressed knowledge of 20 devices while learning from the DTS-3 AIP Checklist.

When focusing on particular areas in and around the home, more pre-test and test participants knew more about AIP upgrading for bathrooms than any other area in the home. Of note, devices participants most frequently were aware of in the pretest and showed an increase in test knowledge were grab bars from 73.33% (n=11) to 80% (n=12), and walk-in showers from 47% (n=7) to 80% (n=12; see Appendix M). Features with no expressed pre-test knowledge and the biggest increase in test knowledge were extra square footage for wheelchair maneuvering at

the toilet, sink, and tub from 0% to 80% (n=12) awareness and built-in shower seat for the tub or shower from 0% to 87% (n=13).

Based on the pre-test findings, boomers need to increase their AIP upgrade knowledge in the areas of home exteriors, security and safety, overall floor plan, kitchen, appliances, bedroom, products and devices, physical fitness, and communication. In those areas, few participants had pre-test knowledge of the AIP features needed to upgrade those spaces, but the stimulus increased or refreshed their knowledge.

Exterior areas may have had the AIP feature with the most recognition with 93% (n=14) acknowledging the need for ramps, but other exterior devices fell short. Most did not recognize low maintenance materials and a new roof as AIP assistive devices with some even questioning why they were considered as such. For accessible driveways and walks, none may have listed them in the pre-test, but 60% (n=9) acknowledge them in the test. From the pre-test, 40% (n=6) of participants indicated handrails as a needed device, but the stimulus did not assess this device. As to test ramp results, knowledge decreased to 60%.

Few participants listed security and safety devices. Emergency alert devices were mentioned by 20% (n=3) of pre-test participants and Ring Doorbell® by 7% (n=1), but the devices were not assessed in the test. No pre-test participants listed mobile apps or built-in features such as steel doors, deadbolts, and lowered peepholes or sidelights, but 40% (n=6) and 60%, (n=9) respectively, acknowledged them in the test.

Many general AIP features for the overall residence were mentioned in lower pre-test and higher test frequencies. Features mentioned in the pre-test with strong acknowledgment in the test, respectively, were single-level living (n=1; 7% and n=12; 80%), wider doors (n=4; 27% and n=11; 73%), lever door handles (n=2; 13.3% and n=8; 53%), lever faucet and hand held shower

heads (n=1; 7% and n=11; 73%), easily operable windows (n=1; 7% and n=7; 47%), and flooring (n=4; 27% and n=7; 47%). Increased lighting levels were mentioned infrequently (n=2; 13.3%) and without detail in the pre-test. Providing detail on means to accomplish higher illumination levels, such as installing multi-bulb fixtures or increasing lamp wattage and lighter paint colors, increased awareness to 73% (n=11) and 40% (n=6), respectively. Wider doors were a feature participants had an awareness of, but is another example where they lacked an understanding of exact specifications. For example, most did not know the exact minimum requirement for "wider"; were unaware that newer homes have, as a standard, 36" wide doors; and did not know that 36" accommodates the 32" accessible minimum for wheelchair width. Lastly, participants did not list easily operable and access to window coverings in the pre-test, but 67% (n=10) expressed awareness of that feature in the test.

No knowledge of communication and physical fitness features were listed as AIP devices in the pre-test. In the test, communication showed an increase in awareness for video calling and social media (n=10; 67%) and wireless high-speed internet (n=9; 60%). Few participants (n=6; 40%), however, felt an exercise area and applications or videos influenced AIP success.

For all features and categories, except for ramps and those not in the test, an increase in knowledge occurred due to the stimulus. See Appendix M for additional increases in kitchen, appliances, bedroom, and products and devices.

Stigma

In the DTS-3 post-test reflection, participants compared the ratio of AIP Checklist items they felt stigma toward versus those they did not. Few devices were stigmatized and were described as elderly or disability products. In general, most participants felt the larger ratio of

devices evoked no stigma because they had most items already in their homes. The predominant number of participants described these devices as standard or practical products.

This study's ability to influence assistive device stigma with AIP education was assessed in post-test questions and is marked by an increase from 60% (n=9) pre-test to 73% (n=11) post-test participants not associating stigma toward most AIP assistive devices. Also, 60% (n=9) of pre-test boomers increased to 93% (n=14) of post-test boomers who consider standard products or architectural devices to be AIP assistive devices. More persuasively, most pretest participants who were either unsure or did not feel standard products were AIP assistive devices had changed their minds in the post-test. Lastly, over half (n=8; 53%) of post-test participants felt that learning about standard products and upgrades with AIP characteristics had helped them understand that upgrading for AIP includes very few elderly or disability products.

Evidence to dispute this study's ability to sway stigma with an AIP Checklist showed that 73% (n=11) of pre-test and 80% (n=12) of post-test participants felt that a lack of device knowledge had not contributed to their stigma. Also, 47% (n=7) were either unsure (n=4; 27%) or disagreed (n=3; 20%) in the post-test that learning most AIP features were standard products had increased their knowledge about AIP features. This is despite the fact that after the stimulus an overwhelming majority (n=14; 93%) classified most AIP products as standard products for use by anyone, not stigmatized, elderly or disability products.

Did the stimulus influence pre-test to test stigma? This question was not specifically asked in post-test reflection, but out of 17 devices mentioned in both the pre-test and test, 10 or 59% of features showed a decrease in stigma, 3 or 17% showed an increase in stigma, and 4 or 24% stayed the same at 0% stigma. Those devices with a decrease in stigma include ramps, wider doors, lower sinks or counters, lighting, flooring, grab bars, shower chairs, walk-in

showers, therapeutic tubs, and seating. Devices that increased in pre-test to test stigma were pull-out base cabinet shelving, lever faucet handles and hand held shower heads, mobile shower chairs, and level thresholds at the exterior. Two of these increases were minimal and plumbing feature stigma increased from 0% to 20% (n=3).

More Education Needed

Participants do feel an increase in AIP education is needed. More than half (n=9; 60%) of participants felt manufacturers of standard products with AIP characteristics are not doing enough to educate consumers on their products. Participants felt manufacturers could do more to promote AIP products through labeling, advertisements, internet, social media, infomercials, and interactive installations to improve consumer education. One participant also commented on the potential effectiveness of federal, state, and local governments, in conjunction with elder agencies in developing strategies to improve education.

Upgrade Activity

When asked about timeframes for upgrading their homes for AIP, the predominant amount of participants said they would be more willing to introduce standard products with AIP characteristics now (n=7; 47%) or in the next 5 years (n=3; 20%) and stigmatized products in 10 years (n=2; 13%), 20 years (n=6; 40%) or never (n=2; 13%). In group discussion, three participants reflected that they should not wait, but upgrade the stigmatized areas first so as not to be caught off-guard by a medical emergency. Another felt devices with less stigma may not be needed in every life stage, but are practical to have. Others felt they could wait and install the devices as needed.

Prototype

Individual participant knowledge on the content participants would include in an educational prototype was sought in the test scenario during the DTS-3 AIP Checklist stimulus. The Checklist gave participants the opportunity to identify AIP features they felt were important to share with peers (see Appendix M). Devices perceived as important to share with others ranged from 3 to 31 devices out of 33 with an average of 12 devices per participant. Devices participants would recommend most included easily operable windows (n=12; 80%); single-floor living, low maintenance exterior materials and a newer roof, an accessible driveway and covered exterior walkway, and remote monitoring systems (n= 11; 73%); and an accessible entry area with a cover, accessible entrance door, and continuous anti-slip flooring with no thresholds (n=10; 67%). Many other devices were recommended as important to share by 60% (n=9) or more participants (see Appendix M).

The data from important devices to share had some interesting relationships with awareness and stigma findings. Post-test devices participants desired to share ranging from 67% and greater were also low awareness pre-test devices ranging from 0% to 27%. This suggests some participants have the desire to educate others where possible gaps exist in AIP upgrade knowledge. Conversely, devices with greater overall pre-test and test awareness, such as ramps and some bathroom upgrades, had lower percentage peer recommendations. This suggests participants may feel some AIP upgrades are common knowledge and are not as important to share with peers.

Prototypes were created by six of the seven groups. The AIP prototypes created by the groups consisted of an AIP product identifier, a specialized assistive product, full scale mock-ups and models, a home improvement show, a newsletter, and residential improvement store publications.

Concerned about consumers' ability to identify AIP products, Group 2 created a product label (see Appendix O). The label is intended as a universal symbol that distinguishes safe and easily used assistive products and features for the elderly or disabled. It would be found on both disability or elderly specific products and standard products with AIP characteristics. The idea would be similar to existing product symbols currently used in the consumer market to identify products such as Energy Star©, Underwriters Laboratory©, age specific toys or games, or other advisory labels. An educational component would also accompany the symbol. The education would be delivered through media such as television advertisements and posters in doctor's offices, community centers, sides of buses, and in hardware and big box stores. The symbol would endorse AIP concepts such as self-education, safety, and sharing information and resources with others. Stores could dedicate a section or aisle to these products and educational materials to bring initial awareness to the products as well as for shopping convenience. Ideas generated by Group 2 prior to prototyping included better educating building industry professionals on AIP, and AIP assistive device magazine articles targeting the boomer demographic.

Group 3 ideas focused on specialized assistive products (see Appendix P). Their developed prototype was kitchen counter mounted handrails. The handrails would assist ambulatory elderly or disabled in navigating the kitchen environment. They would be offered as an option when purchasing kitchen countertops or as an add-on for existing counters. Ideas entertained by the group prior to the final prototype were no threshold doors to reduce tripping hazards and door seals to reduce heat loss.

For a prototype, Group 4 created a model home or full scale mock-ups of residential areas addressed by AIP (see Appendix Q). The model home would be created by mobile home or pre-

fabricated housing companies as a show or tour model. The full scale mock-ups would be installed in home improvement retail stores. They would act as working models in product specific areas or aisles throughout the store to demonstrate both elderly or disability specific and standard products and features used for AIP upgrades. Specific Group 4 mock-up suggestions included accessible doorways and entrances with ramps, lighting for walkways, sinks and toilets, and safety and security features such as smoke and carbon monoxide detectors. The models would promote aesthetically pleasing AIP options with an emphasis on standard products, comfort, and energy efficiency. Both model home and full scale mock-ups could also be displayed at sales sites and at home shows. An educational component the mock-ups would address is the importance of pre-planning or phased implementation of AIP options whenever maintaining, renovating, or replacing finishes in the home. All ideas generated by Group 4 prior to the final prototype contributed to and were used in the final.

Group 5 felt AIP education would be best delivered to boomers through a televised home improvement show (see Appendix R). The show would be dedicated to educating and addressing the issues of incorporating more attractive options for AIP. It would air in a non-conflicting time frame after the evening news, such as 7:30, when it would not interfere with the target market's most watched shows. The improvement show would focus exclusively on AIP checklist recommended upgrades; emphasize design as a forethought, not an afterthought; showcase aesthetically pleasing products and features and budget friendly options; cover installation and construction methods; and provide resources. One idea for a show segment was aesthetically pleasing and unnoticeable exterior ramps. All Group 5 initial ideas were used in the final prototype.

Group 6 used an idea they were aware of, a quarterly mailed newsletter, as a springboard to create their prototype (see Appendix S). From the group's experience, they felt it was an informative and useful option, having witnessed its positive benefits from distribution in their native state with a high elderly population. The publication would be created in large print format to increase legibility and use color images to convey ideas. It would be provided at no cost to aging households, the library, elder agencies, and health care organizations. The newsletter would inform residents about AIP features and highlight the benefits of upgrading homes through success stories. The newsletter would encourage business participation and also identify local resources for obtaining materials, products, and recommended contractors for implementing work. A mailed publication was chosen due to the unfamiliarity some older boomers may have with technology. Mailing also has the potential to reach a larger percentage of the population. An optional delivery method could be the newsletter in digital format burned to a CD. Support and funding for the effort could come from state and local stakeholders such as elders, businesses, and government offices and officials. Those who support the effort would receive recognition through the newsletter. Group 6 participants included all pre-prototype ideas in the creation of the final.

Lastly, Group 7 created an AIP publication for distribution by residential improvement stores (see Appendix T). Most home improvement retail stores already publish sales circulars and magazines that provide ideas for general renovations and do-it-yourself projects. Group 7 proposed to include AIP upgrades within an existing publication or to create a new one dedicated solely to that purpose. Published twice to four times per year, the publication would provide AIP ideas in a more attractive and understandable manner. It would also act as an idea generator with color photography, identify do-it-yourself (DIY) AIP projects, and convey abbreviated DIY steps

and links to additional resources. Example articles would detail projects such as ramps, low maintenance landscaping, exterior and interior lighting, walkways, flooring, cabinet shelves with pullouts, more square footage in bathrooms, walk-in showers, and so on.

Prototype Assessment

In the Prototype Evaluation, no group felt their final product evoked stigma. When asked if they would change anything about their prototype, participants felt their input was sufficient. Four out of the six groups who created prototypes felt they had consciously used positive language or tried to convey their idea in a more attractive and acceptable manner in an attempt to influence stigma. Five out of six groups created prototypes that educated boomer consumers on a broad range of AIP Checklist features and topics, versus specific areas of the home or single products.

Most participants felt they had not addressed phasing or planned implementation of AIP features within their educational concepts. However, three groups addressed the importance of selecting or incorporating AIP features in the planning and construction process for new homes, and two groups discussed the importance of selecting homes with existing AIP features when purchasing. Another group addressed phasing by stressing the importance of design and pre-planning when it comes to such features as ramps and grab bars to ensure they are attractive, less visible, and in place if a health crisis or mobility issue should occur.

Other Findings

The study sought to understand how research findings on AIP device awareness might influence boomers' lifestyle renovation choices, fall risks, product visibility, socialization, technology awareness versus architectural upgrades, and boomers' perception of exercise space, equipment, or media as an AIP assistive upgrade. These topics predominantly focus on pre-test

data since that is the current state of decision making for most boomers. This study also used literature to take another look at how participant pre-test and test awareness compared to experts' perception of priority AIP features and features currently found in U.S. housing.

Comparison to Research on Boomer Lifestyle Improvement Renovations

This study sought to understand how awareness aligned with boomer renovation activity. Lifestyle renovation activity was found to be the most active in areas of energy efficiency upgrades, exterior upgrades, and kitchen and bath improvements (see Appendix I). In the pre-test, greater AIP upgrade awareness was found in exterior features such as ramps (n=14; 93%) and handrails (n=6; 40%) and in bathrooms with grab bars (n=11; 73%), assistive toilets (n=9; 60%), and walk-in showers (n=7; 47%; see Appendix M). In the test, device and area knowledge remained focused on bathroom features such as built-in shower seats (n=13; 87%); walk-in showers, grab bars, and extra square footage in bathrooms (n=12; 80%); and touch or lever handled plumbing fixtures (n=11; 73%). But it also expanded to overall floor plan awareness with single-floor living (n=12; 80%), increased lighting levels (n=11; 73%), wider walkways and doors (n=11; 73%), and recliner lift chairs (n=13; 87%). Since cost saving initiatives are important to most, especially retirees, it was surprising that energy efficiency upgrades were not mentioned in the pre-test. Also, kitchen AIP improvements had low pretest and test results; 7% (n=1) and 60% (n=9), respectively, for pull-out base cabinet shelving and 53% (n=8) as a post-test result for adequate counter space, despite being a high renovation activity.

Comparison to Research on Fall Risks

According to Stevens et al. (2014), most falls occur on the exterior of the home in areas characterized as a garden, lawn, or woods (31.7%); 19.9% on outdoor stairs; and 18.8% on sidewalks or driveways. Pre-test participants addressed exterior outdoor stairs with ramps (n=14;

93%) and handrails (n=6; 40%), but not AIP solutions for minimizing or making activities safer in auxiliary areas or sidewalks and driveways.

In the Stevens (2014) study, the bathroom was the area with the most statistical significance for fall risk. Participants' pre-test awareness of bathroom devices was higher overall than any other area in the home and listed key accessibility components such as grab bars (n=11; 73%), assistive toilets (n=9; 60%), and walk-in showers (n=7; 47%). Other areas known for high fall risks, such as living rooms and bedrooms, were barely mentioned, if at all, by pre-test participants.

Comparison to Research on Product Visibility

This study explored literature on product visibility and sought to know how it might influence AIP awareness and stigma. The pre-test produced awareness of few highly advertised AIP features. Advertised AIP products listed in the pre-test included stair chair lifts (n=4; 27%), assistive chairs (n=4; 27%), walk-in or therapeutic tubs (n=3; 20%), emergency alert devices (n=3; 20%), Ring Doorbell® (n=1; 7%), and Alexa® (7%). All of these advertised features, except Ring® and Alexa®, had high levels of pre-test stigma with 75% (n=3 out of 4), 67% (n=2 out of 3), 100% (n=3 out of 3), and 67% (n=2 out of 3), respectively (see Appendix M). In the test, feature awareness for product visibility included assistive chairs (n=13; 87%) and therapeutic tubs (n=7; 47%), and they both were stigmatized by 40% (n=6) of participants.

Comparison to Research on Increasing Means of Socialization

Pre-test data produced one means of additional communication; one participant suggested adding a bathroom phone. Participants may currently have video conferencing, social media, and cell phones, but are not seeing the impact alternate communication forms will have on socialization during the AIP process at this time.

Comparison to Research on Technology Interest Versus Architectural Awareness

A study by Philips and Global Social Enterprise Initiative at Georgetown's McDonough School of Business found in a 2014 study that boomers are more interested in technological AIP upgrades, rather than architectural, especially technology they are familiar with and use on a daily basis (Philips, 2014a). This study found pre-test awareness of devices was overwhelmingly architectural and standard features (n=27 out of 30; 91%) versus technological (n=3 out of 30; 9%). Seeking preference of AIP device type was not a goal in this study, but the data on awareness reveals education on technological AIP options is lacking.

Comparison to Research on Exercise Appurtenances as AIP Assistive Upgrades

Very little information could be found in research on boomers' plans for incorporating equipment or media or dedicating space for maintaining their health while AIP. This study, therefore, wanted to assess boomers' perception of exercise devices as AIP features. In the pre-test, no participant listed health or rehabilitation features as an AIP device. During the AIP Checklist stimulus, 40% (n=6) of participants expressed an awareness of these features being AIP devices and that they were also important to share with others. No participant expressed stigma toward exercise areas or health and wellness apps, videos, or video games. The data reveals that boomers are not equating successful AIP with physical fitness.

Comparison to Research on Expert Prioritized and Current Housing AIP Features

Individual participant pre-test and test knowledge was compared to expert prioritized AIP features found in the Fifteen Priority Features list adapted from the Center for Universal Design's list (2006) and to the five AIP features found in 1% of U.S. housing. In the Fifteen Features list, AIP features that participants expressed little to no knowledge of during the pretest showed a marked increase during the stimulus. This was seen in the following features: single-

level living (n=12; 80%), entrance requirements (n=9; 60%), wider halls (n=11; 73%), accessible bathroom requirements (n=12; 80%), and bathroom plumbing fixtures (n=11; 73%; see Appendix C). A notable increase in pre-test to test knowledge was also observed in wider doorways from 27% (n=40) to 73% (n=11), increased lighting from 13% (n=2) to 73% (n=11), adaptable sinks from 27% (n=4) to 53% (n=8), and curbless showers from 47% (n=7) to 80% (n=12). Ramps and grab bars were features most pre-test participants were aware of as being AIP devices (n=14; 93% and n=11; 73%, respectively). Knowledge of ramps decreased to 60% (n=9) in the test, however. Overall, the number of devices partially listed by participants in the pre-test was 9 out of 15 or 60% of the list, and test knowledge increased to 14 out of 15 or 93%.

Individual participant pre-test and test data was also compared to the five AIP features currently present in 1% of U.S. housing (JCHS, 2014a; see Appendix D). Fewer pretest participants (n=4; 27%) than test participants (n=11;73%) had knowledge of wider doorways as an AIP feature. The same was the case for lever-style door handles (n=2; 13.3% in the pre-test and n=8; 53% in the test). Only one pre-test participant had knowledge of both lever faucet handles and single-level living in the pretest with 73% (n=11) and 80% (n=12), respectively, expressing knowledge of them in the test. An alternate means for no-step entries, however, was listed in the pre-test and provided in the test via ramps. The majority (n=14; 93%) listed ramps in the pre-test, but only 60% (n=9) expressed knowledge of them in the test. No participant mentioned wider halls or accessible electrical controls and switches in the pre-test. In the test, wider halls were included in the description with wider doors. Accessible electrical controls and switches were not included in the test. Overall, participants expressed partial pre-test knowledge of four out of five of existing AIP devices currently in U.S. homes and four of the four devices

that were used in the test. Additional pre-test and test results for AIP devices are compiled in Appendix L.

Chapter 5: Conclusions, Interpretations, and Implications for Future Research

AIP Term, Concept, and Stigma

Over half expressing unfamiliarity with the term *aging in place* and a little less than half having never used the term could be due to 45% learning about ongoing living assistance (AP-NORC, 2014) from uninformed social circles. It could also point toward a possible gap in AIP education between the general public and experts within government agencies and higher education. Participants who expressed familiarity with the concept of aging in place likely did so because they have or are currently providing some level of long-term care for an elderly family member. Those unfamiliar or unsure of the concept in the pre-test could be due to having less elderly care experience or none at all. For the post-test 40% who claimed to be unfamiliar or unsure of the concept, this study may have been their first experience with the information.

Those who thought not knowing the term might limit their ability to find AIP resources might have already been through the upgrade or long-term care process and realized the benefit of knowing the term. The 40% who were unsure or did not feel knowing the term was important may not have much experience with long-term care.

Rejection of the term by 20% of participants reveals the attitude and degree of stigma some boomers may have toward the issue. Some boomers might connect and be more accepting of an alternative term for aging in place. Further research using design thinking strategies is needed in order to reveal additional insight into the topic and more palatable terms. More importantly, a more positive, universal term could be used as a springboard for generating conversation, creating visibility for the issue, and launching a cohesive AIP educational initiative with reputable backing. To assist online upgrade research, alternative AIP phrases should be implemented as search engine terms and generate AIP checklists when used. Additionally,

further studies should assess the need for more organized and better prioritized AIP internet resources.

AIP Product Awareness

This study suggests that individual AIP home upgrade knowledge is limited. Reasons found in this study for limited knowledge include a lack of individual and group education on AIP assistive devices, a perception of not needing AIP devices, limited knowledge on exact device requirements, an inability to identify AIP products and their characteristics from standard product offerings, a lack of AIP device designation in standard products lines, a deficiency in convenient AIP resources found within mainstream media sources, a possible gap in expert education that is understandable to lay persons, and a lack of governmental support pushing for social awareness and boomers to upgrade.

Of the vast number of possible AIP assistive devices, most pre-test participants knew of 10 or fewer devices, with an average of 7. When individuals shared their knowledge in groups, the average increased to 10.7 devices. The stimulus doubled AIP feature knowledge to 20 devices and the post-test revealed no additional features. This study proposes that learning was limited by the length of the stimulus. To offset respondent fatigue, the length and content was carefully selected and shortened. This suggests that learning from an elongated or unedited AIP Checklist might further increase boomer knowledge of assistive devices, but again, learner fatigue and willingness to learn are factors that influence learning.

Unawareness of residential AIP devices could also be due to a lack of examples in current housing and product visibility in the media. Without conducting AIP device research, boomer consumers' most readily available educational resources are commercial environments and the media. Support of public environments as an educational source is seen in the most

frequently listed, pre-test, top six devices being ramps, grab bars, assistive toilets, walk-in showers, and handrails. Participants have likely learned of these assistive devices through direct observation or interaction in public facilities.

The low number and awareness of advertised AIP features in the pre-test suggests either advertising efforts for boomers are proving to be ineffective or that participants have not personally experienced these features in residential environments, and are not as familiar with them. Features known for product visibility, such as emergency alert devices and therapeutic tubs, were present in the pre-test, but were mentioned by fewer than 27% (n=4) of participants and represented a low percentage of the devices listed (4 out of 30 or 13%). Lastly, the test also mentioned visibility products, but one of the most advertised products in multiple media, therapeutic tubs, only had a median level of awareness (n=7; 47%).

Knowledge and installation of every assistive device is not required; just the ones that are needed by the individual users must be known. But individual boomer requirements will increase as age progresses due to degenerating health, chronic illness, and possibly compound if boomers share a residence together. With an increase in age and disability, knowledge will also have to increase. This study implies that learning about AIP upgrades from individuals and peer groups, as 45% of Americans do (AP-NORC, 2014), is an inadequate source of AIP upgrade information. The study also shows that women have slightly more pre-test AIP device knowledge than men. This is possibly due to their tendency to assume elderly caregiver roles. Men, however, may need to increase device awareness due to less of them with caregiver experience, extended life expectancy, rising boomer divorce rates (National Academy of Social Insurance, n.d.), and an unwillingness of 66% of children to care for their father in their own home (Visiting Angels, 2013).

The inability of participants to name assistive devices in a post-test could be attributed to a lack of education, but also to their current mindset and physical state. While many older individuals are engaging in lifestyle upgrades, AIP assistive devices are not a part of their present reality due to not currently experiencing physical disability, not suffering to the point of needing assistive devices, or implementing work-arounds to deal with disability.

Awareness for ramps dropped in the test to 60% (n=9) from 93% (n=14) in the pre-test. Of the 17 devices present in both the pre-test and test, this was the only instance where this occurred. A decrease in ramp test awareness could have been due to participants not knowing the additional specified, yet still simplified, device requirements for ramps. Not being educated on specific accessibility and installation requirements for assistive devices could also create future potential harm to users due to unnecessary, inadequate, or unsafely installed devices.

The number of boomers in this study who did not connect home fitness with AIP is alarming. In this study, 60% of boomers did not see exercise media, equipment, or exercise space as an AIP assistive device. An overwhelming body of research has proven the benefit of exercise and nutrition for older adults, but this initiative has not extended to a physical manifestation within boomer homes. To make this happen, further educational initiatives should occur that include health and wellness experts as AIP stakeholders. Their objective should be defining and educating boomers about minimum parameters for safe equipment, media, and space requirements along with suggested exercises and fitness goals boomers can accomplish within their AIP home. This should also extend to the labeling of age and ability specific equipment.

AIP Product Stigma

This study suggests that stigmatization of some devices does exist. Establishing device stigma as an adoption barrier was inconclusive, however. The study established that feelings of

stigma exist toward some AIP assistive devices; strong feelings in some instances. Features that were consistently recognized in all three stigma DTS with both a high level of awareness and higher levels of stigma were ramps, stair chair lifts, and grab bars. Assistive devices mentioned more frequently and having no associated stigma include walk-in showers, lever door handles, and wider doors.

Participants overwhelmingly did not support device stigma as a reason for not preparing their homes for AIP. Yet in the post-test, a little over half of boomer participants recognized AIP assistive devices as a source of visible stigma. In contrast, the majority recognized AIP devices as standard products or features with AIP characteristics. This indicates there is still some confusion about how participants feel about AIP assistive products. Their strong feelings of visible stigma toward some devices are clear. Some participants suggest aesthetics is to blame, but others cite design, exclusive marketing as elderly or disability products, or even a combination of the two.

Aesthetics were often cited as reason for stigmatization with devices such as grab bars and ramps. Exterior ramps were particularly singled out as a source for visible stigma due to their prominent exterior placement usually in the front of the home, construction of contrasting materials making them more visible, and noted for their poor design and quality. Ramps were cited as an indicator of old age, disability, and helplessness with one group calling them an open invitation for predators. This suggests aesthetics for all AIP products and features should be improved to either make them more appealing or less visible, not only for aesthetic reasons, but also to allow users not to be identified or labeled by them. Improved design cannot change stigma alone, however. Education and promotion plays an important role. Lastly, manufacturers who have already addressed aesthetics of stigmatized AIP products should better promote them.

How groups make their decisions on AIP features should be given additional attention as an adoption barrier. Within the study, group dynamics impacted stigma ratings. More involved debate over stigma occurred within the group strategies utilizing married couples than with the group of unrelated individuals. When working together toward a final decision, compromise or relenting occurred, requiring more thought about others' needs or desires. An example was a taller husband who preferred taller toilets. He willingly compromised on a higher stigma rating than he felt, however, since his petite wife felt stigma toward them.

Another relationship dynamic that may influence AIP feature adoption is the impact not upgrading will have on future caregivers. Another real life example that emerged during the study was a husband and wife who discussed their recent upgrade activity. During their upgrades they contemplated three features: exterior handrails at the steps, grab bars, and an exterior ramp. Despite declining health, long-term disability, and temporarily debilitating future surgeries facing them both, the husband would not have installed any devices because he felt they just didn't need them. Yet he denied having stigma toward those devices. His wife, however, would willingly make any necessary changes to lighten the physical and emotional burden of caring for another, but relented on some upgrades due to his stubbornness. The feature they debated over most and did not install was a ramp. This highlights the need of AIP upgrades to assist not only the elderly or disabled, but also to support the emotional and physical welfare of caregivers.

Based on these findings, this study asserts that relationship dynamics and group decisions within the family unit take precedence and overrule individual stigma, desires, needs, and even individual and expert knowledge when it comes to implementing AIP upgrades. If boomers inadequately prepare, their caregivers (children, siblings, and extended family members or friends) will be forced to possibly compromise their own health by caring for them or suffer time

and financial loss by undertaking the upgrades for them. Because of this, multi-generational caregiver awareness levels and feelings toward AIP features merit research as well. More research is needed to clearly discern how stigma frames AIP upgrade decisions.

Education's Influence in This Study

Understanding how boomers feel about AIP education and AIP assistive devices was the focus of this study. To ensure the success of any educational design, certain information about the target population must be known prior to development. Aspects concerning entry skills and group characteristics were found in the literature review. While not directly measured, the following information was discovered or reinforced about boomers during this study: prior topic knowledge, attitudes toward the content, academic motivation, general learning preferences and potential delivery systems, and attitudes toward the organization creating and providing instruction (Dick, Carey, & Carey, 2015).

Prior Topic Knowledge

This study suggests that boomers' prior topic knowledge on AIP devices in this sample is limited without education. Despite 93% (n=14) of participants' claims of having the entry skill of long-term elderly care experience, pre-tests revealed individuals were aware of few devices. Additionally, a post-test revealed an inability to list any further devices. Only with the educational stimulus was knowledge able to dramatically increase.

Attitudes Toward the Content

This research demonstrated that an attitude of stigma toward some AIP features is a factor to contend with in the creation of instructional content. The data suggests there is a link between limited pre-test device knowledge and stigma with 9 out of 15 or 60% of participants expressing some degree of stigma toward over half of the pre-test devices they listed. Also,

devices listed most frequently and first among participants (ramps, grab bars, and assistive toilets) had higher average stigma ratings with mobile potty chairs having the highest.

In this study, education via an AIP Checklist helped over half of the participants understand that most AIP devices are standard products with AIP characteristics, not stigmatized elderly or disability products. Additionally, the AIP Checklist education may have reduced stigma for some devices. Of the 17 devices present in both the pre-test and test, 10 or 59% of features showed a decrease in stigma. This may have been due to the additional details about the products, or the group discussion on rating stigma.

Another interesting shift in stigmatization occurred from the pre-test to the test. The devices participants had the most test awareness of did not receive the highest stigma ratings as was the case in the pre-test. When comparing pre-test and test individual device awareness, a shift occurred from a focus on stigmatized items to standard features. For example, in the pretest, ramps (n=14; 93%), grab bars (n=11; 73%), and assistive toilets (n=9; 60%), were the devices participants were most aware of and also had higher stigma ratings of 79% (n=11 out of 14), 45% (n=5 out of 11), and 78% (n=7 out of 9), respectively. In the test, items participants expressed the most awareness of were built-in shower seats and recliner lift chairs (n=13; 87%), and walk-in showers, grab bars, extra square footage in bathrooms, and single-floor living (n=12; 80%). The highest stigma rating among those test devices was grab bars with 40% (n=6) of participants expressing stigma. To note, assistive toilets were not included in the test for comparison.

A means to educate those who reject anything to do with getting older must also be addressed. This study discovered a small cohort of those who felt stigma toward the term and concept of AIP along with 27% (n=4) of post-test participants who felt stigma toward most of

the devices in the AIP Checklist. This research did not specifically focus on this problem, but further research is needed. Unfortunately, education to reduce boomer stigma must occur before manufacturers will be willing to even identify their products as AIP devices and advertise to boomers. The assistive device industry and device development as a whole is in the later stages of its first generation of products. In 5 to 15 years, boomer demand for AIP assistive devices may increase, as well as their device knowledge. The perpetuation of device stigma will not only discourage manufacturers from advertising to boomers (Barnhart & Peñaloza, 2013), but it may also delay the entrance of second generation AIP device research and development. To advance their products and AIP education, manufacturers may need to become AIP educational stakeholders. When manufacturers do begin marketing, they must carefully appeal to their target demographic by abstaining from demeaning stereotypical references and images (Wallis, 2014). Marketers must also commit to increased product visibility for campaigns to be successful. Research shows the act of increasing a product's presence in any media can greatly impact product acceptance (Vaes et al., 2012). Group 5 came closest to the idea of increased product visibility in their nightly AIP home improvement show.

Academic Motivation

Motivation for learning about and installing AIP upgrades is a concept in need of more research. The literature revealed that only 20% have started researching means to implement ongoing living assistance, which includes upgrading for AIP (AP-NORC, 2014). Additionally, 59% of boomers have stated they are not interested in upgrading and only 15% are willing to spend and update to whatever extent needed (Philips, 2014a, 2014b). This suggests most boomers' current academic motivation for learning about AIP upgrades is low. Especially since 70% of those aged 40 and older think they will be able to avoid long-term care planning and

costs by relying on family to do it for them (AP-NORC, 2014). The findings from this research suggest general AIP upgrade education and education on timing or phasing may influence motivation, but the influence of do-it-yourself projects should also be explored.

Pre-planning or phased implementation could be an initiative to increase assistive devices within boomer homes. Post-test questions on phasing helped participants understand that standard feature upgrades could begin soon or within five years and those with stigma could be installed later. Three groups felt phasing was important enough to make it part of their educational prototype. Group 4 used their prototype to encourage boomers to choose AIP options whenever maintaining, renovating, or replacing finishes. The desire to install stigmatized products later could be due to participants thinking they still have time, denial of degrading health issues, or the perpetuation of rejecting anything that would label them as old. Physical injury or a worsened health condition can occur at any time, however, leaving home owners unable to navigate their environment and at greater risk for further injury. Not including phased device installation in the prototype could reveal a low priority on the initiative. With few homes currently having well planned AIP features, boomers may not realize the impact pre-planning and phased installation has on reducing visible stigma versus poorly planned and rushed installations. Therefore, a shift must occur in the residential building and remodeling market so that stigmatized accessible features become standard in the consumer mindset, new homes come equipped with accessibility features, and home maintenance and renovation for existing housing becomes an opportunity for incorporating AIP options.

AIP has yet to enter the DIY home improvement market, but the potential for large numbers of boomers in need of accessibility upgrades is a forecast for major growth within the industry (JCHS, 2015). Since DIY usually depends on the help of family or friends for

installation (Urken, 2013), and gen-Xers and millennials (boomers' children and grandchildren) are leaders in the DIY market, additional studies should be conducted to ask multigenerational AIP stakeholders' opinions on AIP DIY upgrades. Lastly, DIY has yet to be explored in AIP studies as a means to reduce the adoption barriers of willingness to adopt and cost.

General Learning Preferences and Potential Delivery Systems

General learning preferences and potential delivery systems for boomers were revealed in the educational prototypes created in this study. The variety of prototypes created that currently do not exist, but parallel present educational media, suggests that manufacturing and building contractor AIP stakeholders are following rather than leading public demand and should presently be exploring and introducing greater means of product visibility. The variety in the types of educational prototypes created also proves that boomers are open to multiple educational formats. Five of the six prototypes encouraged learning via observation or interaction with AIP devices through the use of model homes or full scale mock-ups, product displays, televised home improvement shows, and newsletters or improvement store publications highlighting AIP features and installation steps. Desiring to learn about AIP devices through environmental interaction is the same premise set forth in this study that participants gained pre-test device awareness from those in public settings. This suggests that a means for increasing AIP device awareness could be through the installation of and interaction with AIP features in public occupancies. Assistive grab bars have already become a standard feature of tub enclosures and some hotels have begun to vertically install grab bars outside the tub to assist with stepping in and out. An example that could solve stigma toward assistive toilets and grab bars is to install more of these devices in standard stalls of public restrooms. If grab bars and assistive toilets are a part of standard stalls, the products might possibly become standard in consumer's minds.

Potential delivery systems that may not work are those that require extensive digital interaction. One participant, who is an expert in the field of AIP, suggested the extent of digital interaction that boomers may be able to handle is compact discs versus endless website searches, QR scan codes, or interactive digital environments. With the growing rate of boomer smart phone usage, middle and younger boomers, however, may best be able to utilize well organized applications with direct links to websites.

Attitudes Toward the Organization Creating and Providing Instruction

The attitude learners have toward the organization creating and providing instruction can be viewed as reason to accept or reject instruction. Some study participants acknowledged the absence of governmental agencies from the AIP upgrading issue and felt their presence and involvement might be a missing factor for mobilization and change. Other organizations known for their involvement in AIP issues were not mentioned, suggesting the question should have been retained in the survey, that participants lack an awareness of such organizations, that they reject organizations who deal with aging and disability issues, or that the organization providing educational materials was not an issue.

Limitations

This study is not representative of the boomer population due to a small sample size and a lack of representation from ethnic groups. Due to the length of the study, data collection from a representative sample was not possible within the allotted timeframe. Also, ethnic representation was difficult due to the location of the study: East Tennessee and Western North Carolina.

The general reading level and the type of data collection methods were limitations within this study. A common complaint among all final study participants was the general reading level

being inappropriate for their educational level. This was not revealed in the pilot study due to those participants having higher education levels and degrees.

The design thinking strategies were a limitation due to the length, amount of writing, and required activities leading to attrition. The time and involvement required to complete the DTS was a common complaint for all participants. Study length was addressed in the pilot, but the pilot participants worked in higher education and may have been accustomed to intricate and lengthy assignments. The amount of writing required within the DTS was difficult for the target population due to arthritis or carpel tunnel syndrome. Additionally, the stimulus in DTS-2 did not convey the meaning of stigma well and may have limited the results. Participants frequently asked for further definition of stigma.

The activities required within the prototype and evaluation led to attrition. One group refused to attempt DTS-4. Most were confused by the vagueness of creating "something" to educate boomers on AIP and felt the questions were repetitious. All participants required additional explanation beyond the written directions and would have preferred to have created something from a list of educational media options. Most were opposed to sketching, felt it was unnecessary, and opted to provide further written descriptions. To note, most ideas were created by the participant chosen to write the group responses. Therefore, group participation was minimal. Study participants expressed a preference for the closed-ended instruments versus the open-ended DTS. They felt closed-ended questions would have been more appropriate for their age group for reasons including less time, mental stress, and physical fatigue. However, the five categories of Likert scale responses often confused participants and seemed inappropriate.

Final Thoughts

Many factors have created the problem of inadequately equipped AIP housing. Never have families or the U.S. infrastructure faced such a dilemma, but with almost a quarter of our population aging, the need for accessible housing for seniors will reach epic proportions in the next 5 to 25 years. What is clear is boomers' resounding determination to stay in their homes, but their unwillingness to upgrade with residential assistive devices will ultimately shorten the length of their stay. This study revealed participants' lack of AIP device knowledge and stigma toward some devices to be a contributor to this problem, but it also showed education could alleviate it. Behind every reason that has perpetuated inaccessible housing for seniors there is a stakeholder whose expertise is vital in fixing it. It will take a holistic, multiple perspective approach to solve the problem of inaccessible AIP housing.

References

American Association of Retired Persons. (2010, September). *Loneliness among older adults: A national survey of adults 45+*. Retrieved from http://assets.aarp.org/rgcenter/general/loneliness_2010.pdf

American Association of Retired Persons. (2011, June). *Baby boomers envision what's next.* Retrieved from http://assets.aarp.org/rgcenter/general/boomers-envision-retirement-2011.pdf

American Society of Interior Designers. (n.d.). *Design for aging in place Toolkit: Meeting changing needs - Is design for aging in place for you* [Brochure]*?* Retrieved from https://www.asid.org/sites/default/files/u34215/Aging-In-Place-Toolkit.pdf

Ahn, M., Beamish, J. O., & Goss, R. C. (2008). Understanding older adults' attitudes and adoption of residential technologies. *Family and Consumer Sciences Research Journal*, *36* (3), 243-260.

The Associated Press-NORC Center for Public Affairs Research. (2014, May). Long-term care in America: Expectations and reality. Retrieved from http://www.longtermcarepoll.org/Pages/Polls/Long-Term-Care-2014.aspx

Assistive Technology Industry Association. (n.d.). *Assistive technology: What is it*. Retrieved from http://www.atia.org/i4a/pages/index.cfm?pageid=3859

Babbie, E. (2011). *The practice of social research* (13th ed.). Belmont, CA: Wadsworth.

Baker, K. (2012, Fourth quarter). *Kitchens and baths benefit from broader housing recovery, feature new functions and activities*. Retrieved from the American Institute of Architects Web site: http://www.aia.org/practicing/AIAB097963

Baker, K. (2014a, June). *Accessibility and outdoor property improvements top list of popular home characteristics*. Retrieved from the American Institute of Architects Web site: http://www.aia.org/press/releases/AIAB104136

Baker, K. (2014b). *Homeowners looking to add more home features as upturn takes hold*. Retrieved from the American Institute of Architects Web site: http://www.aia.org/practicing/AIAB104581

Barbour K. E., Stevens, J. A., Helmick C. G., Luo, Y., Murphy, L. B., Hootman J. M., et al. (2014, May 2). *Morbidity and Mortality Weekly Report*. Retrieved from the Center for

Disease Control and Prevention Web site: http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6317a3.htm?s_cid=mm6317a3_w

Barnhart, M., & Peñaloza, M. (2013, April). Who are you calling old? Negotiating old age identity in the elderly consumption ensemble. *Journal of Consumer Research*, *39*, 1133-1153. doi: 10.1086/668536

Bayer, A., & Harper, L. (2000). *Fixing to stay: A national survey on housing and home modification issues.* Retrieved from American Association of Retired Persons Web site: https://assets.aarp.org/rgcenter/il/home_mod.pdf

Centers for Disease Control and Prevention. (2013, August 14*). Healthy places terminology*. Retrieved from http://www.cdc.gov/healthyplaces/terminology.htm

Center for Universal Design. (2006). *Residential rehabilitation, remodeling, and universal design*. Retrieved from North Carolina State University Web site: https://www.ncsu.edu/ncsu/design/cud/pubs_p/docs/residential_remodelinl.pdf

Curd, J. (2014, March). *Are age in place improvements a good investment?* Retrieved from Age in Place Improvements Web site: http://www.ageinplaceimprovements.com/are-age-in-place-improvements-a-good-investment/

Dick, W., Carey, L., & Carey, J. O. (2015). *The systematic design of instruction* (8th ed.). Boston, MA: Pearson.

Department of Justice. (2010, September 15). *2010 ADA standards for accessible design*. [Electronic version]. Retrieved from ADA.gov United States Department of Justice, Civil Rights Division Web site: http://www.ada.gov/regs2010/2010ADAStandards/2010ADAStandards.pdf

DeZube, D. (2014). *HGTV Top 15 home updates.* Retrieved from the Home and Garden Television Web site: http://www.hgtv.com/design/decorating/clean-and-organize/top-15-home-updates

Energy Star. (2015). *About energy star*. Retrieved from https://www.energystar.gov/

Georgantzi, N. (2012, August). *The right to autonomy, health and independent living*. Retrieved from the United Nations, Department for Economic and Social Affairs Division for Social Policy and Development Web site: http://social.un.org/ageing-working-group/documents/AutonomyandHealthNGOEWG2012.pdf

Gill, T., Williams, C., & Tinetti, M. (2000, December). Environmental hazards and the risk of nonsyncopal falls in the homes of community-living older persons. *Medical Care*, 1174-1183.

Harrell, R. (2011, August). Housing for older adults: The impacts of the recession. *AARP Insight on the Issues*, *53*. Retrieved from the American Association of Retired Persons Web site: http://assets.aarp.org/rgcenter/ppi/liv-com/insight53.pdf

Health.gov. (2015). *Physical activity guidelines for Americans*. Retrieved from http://health.gov/paguidelines/guidelines/

Housing Assistance Council. (2014, October). *Housing an aging rural America: Rural seniors and their homes*. Retrieved from http://www.ruralhome.org/storage/documents/publications/rrreports/ruralseniors2014.pdf

Ingstad, B., & Whyte, S. R. (Eds.). (1995). *Disability and culture*. Berkley: University of California Press.

International Code Council. (2012a). *International building code*. Retrieved from http://publicecodes.cyberregs.com/icod/ibc/2012/index.htm

International Code Council. (2012b). *International residential code*. Retrieved from http://publicecodes.cyberregs.com/icod/irc/2012/index.htm

Investopedia. (2015). *Rate of adoption*. Retrieved from http://www.investopedia.com/terms/r/rate-of-adoption.asp

Joa, I., Johannessen, J. O., Bjørn, A., Friis, S., McGlashan, T., Melle, I., et al. (2007). The key to reducing duration of untreated first psychosis: Information campaigns. *Schizophrenia Bulletin*. doi:10.1093/schbul/sbm09510.1093/schbul/sbm095

Joint Center for Housing Studies of Harvard University. (2014a). *Housing America's older adults: Meeting the needs of an aging population.* Retrieved from http://www.jchs.harvard.edu/sites/jchs.harvard.edu/files/jchs-housing_americas_older_adults_2014.pdf

Joint Center for Housing Studies of Harvard University. (2014b). *The U.S. population has aged significantly over the past two decades: Share of county population aged 50 and over, 1990 and 2010*. Retrieved from http://harvard-cga.maps.arcgis.com/apps/StorytellingSwipe/index.html?appid=06c855a8779c41b5aed56b3329ad86c7#

Joint Center for Housing Studies of Harvard University. (2015). *Emerging trends in the remodeling market*. Retrieved from http://www.jchs.harvard.edu/sites/jchs.harvard.edu/files/jchs_improving_americas_housing_2015_final_0.pdf

King, D. E., Matheson, E., Chirina, S., Shankar, A., & Broman-Fulks, J. (2013, March 11). The status of baby boomers' health in the United States: The healthiest generation. *JAMA Internal Medicine*, *173*(5), 385-386. doi:10.1001/jamainternmed.2013.2006

Kochera, A. (2002). *Falls among older persons and the role of the home: An analysis of cost incidence, and potential savings from home modification* (Issue Brief IB Number 56).. Retrieved from the AARP Public Policy Institute Web site: http://assets.aarp.org/rgcenter/il/ib56_falls.pdf

Kumar, V. (2013). *101 Design methods: A structured approach for driving innovation in your organization*. Hoboken, New Jersey: John Wiley & Sons.

Leonardi, M., Bickenbach, J., Ustun, T. B., Kostanjsek, N., Chatterji, S., & MHADIE Consortium. (2006, October 7). The definition of disability: What is in a name? *Lancet*, *368*, 1219-1221. doi:10.1016/S0140-6736(06)69498-1 PMID:17027711

Link, B. G., & Phelan, J. C. (2001). Conceptualizing stigma. *Annual Review of Sociology*, *27*, 363–385.

Mann, W. C., Ottenbacher, K. J, Fraas, L., Tomita, M., & Granger, C. V. (1999, May-June). Effectiveness of assistive technology and environmental interventions in maintaining independence and reducing home care costs for the frail elderly. A randomized controlled trial. *PubMed.Gov*. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/10333815

Mercola. (2014, April). *How exercise helps strengthen your bones and avoid osteoporosis, safely and naturally*. Retrieved from http://fitness.mercola.com/sites/fitness/archive/2014/04/25/exercise-bone-health.aspx

Merrill Lynch. (2014, August). *Home in retirement: More freedom, new choices* (Report No. AR5N479P). Retrieved from https://mlaem.fs.ml.com/content/dam/ML/Articles/pdf/ml_Home-Retirement.pdf

Merrill Lynch. (2016). *The End of Old*. Retrieved from https://www.ml.com/articles/the-end-of-old.html#experience=static

MetLife. (2013). *Demographic profile: America's older boomers* (Report No. MMI #00127(0210). Retrieved from https://www.metlife.com/assets/cao/mmi/publications/Profiles/mmi-older-boomer-demographic-profile.pdf

National Academy of Social Insurance. (n.d.). *Baby boomers and long-term care*. Retrieved from http://www.nasi.org/learn/longterm/baby-boomers

National Association of Home Builders. (2015). *Aging-in-place remodeling checklist*. Retrieved from https://www.nahb.org/en/learn/designations/certified-aging-in-place-specialist/related-resources/aging-in-place-remodeling-checklist.aspx

O'Conner, F. (2014, May 8). Baby boomers embrace technology as much as younger users. *PC World*. Retrieved from http://www.pcworld.com/article/2153080/baby-boomers-embrace-technology-as-much-as-younger-users.html

Oliver M. (1990). *The politics of disablement*. Basingstoke: Macmillan and St Martin's Press.

Pai, A (2014, September 10). *Survey: Four years ago half of baby boomers were interested in texting, video conferencing for health*. Retrieved from Mobi Health News Web site: http://mobihealthnews.com/36424/survey-four-years-ago-half-of-baby-boomers-were-interested-in-texting-video-conferencing-for-health

Pew Research Center. (2014a, February, 27). *The Web at 25 in the U.S. the overall verdict: The internet has been a plus for society and an especially good thing for individual users.* Retrieved from http://www.pewinternet.org/files/2014/02/PIP_25th-anniversary-of-the-Web_0227141.pdf

Philips, & Global Social Enterprise Initiative at Georgetown's McDonough School of Business. (2014a, June). *Aging well working session series: Creating connected communities for aging well*. Retrieved from USA Philips Web site: https://www.usa.philips.com/b-dam/b2bhc/us/innovation/thought-leadership/aging-well/Creating_Connected_Communities_for_Aging_Well_FINAL.pdf

Philips, & Global Social Enterprise Initiative at Georgetown's McDonough School of Business. (2014b), *Creating connected communities for aging well*. Infographic poster accompanying study on *Older, but not always wiser: Boomers not considering steps to remain independent as they age*. Retrieved from USA Philips Web site:

http://www.usa.philips.com/philips5/shared/assets/us/Downloadablefile/2014/Philips-Infographic11.pdf

Philips, & Global Social Enterprise Initiative at Georgetown's McDonough School of Business. (2014c, June 12). *Older, but not always wiser: Boomers not considering steps to remain independent as they age, according to Philips and Georgetown University study*. Retrieved from USA Philips Web site: http://www.newscenter.philips.com/us_en/standard/news/press/2014/20140612-GSEI.wpd#.U6r_5vldWSo

Platner, H. (2010). *An introduction to design thinking: Process guide* [Brochure]. Retrieved from Institute of Design at Stanford Web site: https://dschool.stanford.edu/sandbox/groups/designresources/wiki/36873/attachments/74b3d/ModeGuideBOOTCAMP2010L.pdf?sessionID=c2bb722c7c1ad51462291013c0eeb6c47f33e564

Raphelson, S. (2014, November 18). *Amid the stereotypes, some facts about millennials*. Retrieved from National Public Radio Web site: http://www.npr.org/2014/11/18/354196302/amid-the-stereotypes-some-facts-about-millennials

Rubenstein, L. Z., & Josephson, K. R. (2006). Falls and their prevention in elderly people: What does the evidence show? *Med Clin North Am*, *90*, 807–824.

Salomon, E. (2010, March). *Expanding implementation of universal design and visitability features in the housing stock* (Fact sheet 167). Retrieved from AARP Public Policy Institute Web site: http://www.aarp.org/content/dam/aarp/livable-communities/act/housing/expanding-implementation-of-universal-design-and-visitability-features-in-the-housing-stock-aarp.pdf

Setar, L., & Son, A. (2013, April 8). *Baby boomers: A burgeoning customer market* [IBIS World Report]. Retrieved from Media Center Web site: https://media.ibisworld.com/wp-content/uploads/2013/04/Baby-Boomers-A-Burgeoning-Customer-Market.pdf

Skogsrød, I. Ø. (2015). *Empathy and aesthetics: Combating stigma in the design of assistive products* (Department of Product Design, Norwegian University of Science and Technology). Retrieved from NTNU Web site:

https://www.ntnu.no/documents/10401/1264435841/Artikkel+Ingri+Orsal+Skogsr%C3%B8d.pdf/bfedd2cd-d9a2-41af-bb90-52deae0816d4

Smith, A. (2015, April 1). *U.S. smartphone use in 2015*. Retrieved from Pew Research Center Web site: http://www.pewinternet.org/files/2015/03/PI_Smartphones_0401151.pdf

Stevens, J. A. (2010). *A CDC compendium of effective fall interventions: What works for community dwelling older adults* (2nd ed.). Retrieved from Centers for Disease Control and Prevention Web site: http://www.cdc.gov/homeandrecreationalsafety/pdf/cdc_falls_compendium_lowres.pdf

Stevens, J. A., Corso, P. S., Finkelstein, E. A., & Miller, T. R. (2006). The costs of fatal and non-fatal falls among older adults. *Injury Prevention*, *12*, 290–295. doi:10.1136/ip.2005.011015

Stevens, J. A., Haas, E. N., & Haileyesus, T. (2011, June 10). Nonfatal bathroom injuries among persons. *Centers for Disease Control and Prevention*, *60*(22), 729-733. Retrieved from http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6022a1.htm

Stevens, J. A., Mahoney, J. E., & Ehrenreich, H. (2014). Circumstances and outcomes of falls among high risk community-dwelling older adults. *Injury Epidemiology*, *1*(5). Retrieved from http://www.injepijournal.com/content/1/1/5

Talbot, L. A., Musiol, R. J., Witham, E. K., & Metter, E. J. (2005). Falls in young, middle-aged and older community dwelling adults: Perceived cause, environmental factors and injury. *BMC Public* Health, *5*, 86. doi:10.1186/1471-2458-5-86

Urken, R. K. (2013, May 28). Why more people are performing DIY home renovations. *The Street*. Retrieved from Yahoo Finance Web site: http://finance.yahoo.com/news/why-more-people-performing-diy-155500378.html

Vaes, K. (2014). *Product stigmaticity: Understanding, measuring, and managing product-related stigma*. Retrieved from Delft University of Technology, Antwerp University Web site: http://www.tudelft.nl/fileadmin/Files/tudelft/Images/Actueel/Nieuws/2014/Apr-Mei-Jun/Proefschrift_Product_Stigmaticity_digital.pdf

Vaes, K., Jan Stappers, P., Standaert, A., & Desager, K., (2012, September). Contending stigma in product design: Using insights from social psychology as a stepping stone for design strategies. J. Brassett, P. Hekkert, G. Ludden, M. Malpass, & J. McDonnell (Eds.). *Proceedings of the 8th International Design and Emotion Conference 2012 Central Saint*

Martins College of Art & Design, 11-14. Retrieved from Delft University of Technology, Repository Web site: http://repository.tudelft.nl/islandora/object/uuid:3157349a-bd30-4407-83fa-e71939055e9b?collection=research

Visiting Angels. (2013, June). *National survey reveals children choose mom over dad*. Retrieved from http://www.visitingangels.com/(X(1))/national-survey-reveals-children-choose-mom-over-dad-weekly-message_73

Wallis, D. (2014, October). Selling older consumers short: Boomers have the bucks, but advertisers don't seem to care. *AARP Bulletin*. Retrieved from http://www.aarp.org/money/budgeting-saving/info-2014/advertising-to-baby-boomers.html

World Health Organization, & The World Bank. (2011). *World report on disability* (Report No. WHO/NMH/VIP/11.01). Retrieved from World Health Organization Web site: http://www.who.int/disabilities/world_report/2011/en/index.html

Yasamy, T. D., Harper, D. M., & Saxena, S. (2013). *Mental health of older adults, addressing a growing concern*. Retrieved from http://www.who.int/mental_health/world-mental-health-day/WHO_paper_wmhd_2013.pdf?ua=1

Yazbeck, M., McVilly, K., & Parmenter, T. R. (2004). Attitudes towards people with intellectual disabilities: An Australian perspective. *Journal of Disability Policy Studies*, *15*, 97-111. doi:10.1177/10442073040150020401

Zielstorff, R. D. (2003, August). Controlled vocabularies for consumer health. *Journal of Biomedical Informatics*, 326-333. doi:http://dx.doi.org/10.1016/j.jbi.2003.09.015

Appendix A: General or Lifestyle Renovation Types in the Remodeling Market

HGTV Top 15 Home Improvements (DeZube, 2014)	**Architectural Clients** (Baker, 2014a)	**Architectural Clients** (Baker, 2014b)	**Boomer General Renovations** (Merrill Lynch, 2014a)	**Remodeling Market General Renovations** (JCHS, 2015)
Exterior or building materials				
#4 exterior improvements #10. replacement windows[1, 2]		(65%) attic insulation[1, 2] (58%) energy efficiency e.g. triple glaze windows[1, 2]	(34%) improving curb appeal	(20.3%) ext. replacements roofing, siding, windows, & exterior doors[1, 2]
Exterior walks, areas, or structures				
#8 deck, patio or porch addition[2]	(69%) outdoor living space (3%) lot size (56%) blended indoor / outdoor living	(63%) outdoor living	(34%) improving curb appeal	(13.7%) property improvements: detach. garage[2], driveways[2], walkways[2], patios and terraces
Exterior landscaping				
#2 landscaping[2]	(44%)rainwater catchments		(34%) curb appeal	
Kitchen				
#3 minor kitch. remodel[2] #7 major kitch. remodel[2]	(57%) kitchen and bath remodeling[2]	(60%) kitchen and bath remodeling[2]	(32%) nicer kitchen[2]	(9.5%) kitchen remodels and additions[2]
Bath				
#1 minor bathroom remodel[2] #6 major bathroom remodel[2]	(57%) kitchen and bath remodeling[2]	(60%) kitchen and bath remodeling[2]	(29%) nicer bathroom[2]	(7.7%) bath remodels and additions[2]
Equipment				
		(63%) wireless systems[2] (29%) central audio		
Other				
				(8.2%) disaster repairs
Notes: 1) Energy efficient upgrade, 2) Aligns with AIP upgrade				

General or Lifestyle Renovation Types in the Remodeling Market (cont.)

HGTV Top 15 Home Improvements (DeZube, 2014)	**Architectural Clients** (Baker, 2014a)	**Architectural Clients** (Baker, 2014b)	**Boomer General Renovations** (Merrill Lynch, 2014a)	**Remodeling Market General Renovations** (JCHS, 2015)
Reconfigurations, renovations, additions				
#5 attic bed-room conversion #9 basement remodel[2] #11 Family Room Addition #12 bonus room updates[2]	(50%) open space layout (52%)informal space (15%) square ft. increase[2] (59%) remodeling additions/ alterations[2] (28%) volume	(70%) remodeling additions/ alterations[2] (39%) au pair/ in-law suite[2] (37%) mud room (20%) home office (8%) exercise/ fitness[2] (6%) home theater (6%) storm or safe room (3%) hobby/ game	(35%) creat-ing a home office	(13.1%) room additions and alterations[2]
System upgrades or appliances				
		(53%) energy mng. [1, 2] (48%) back- up power[1, 2] (50%) long range controls[2] (41%) solar panels[1] (29%) electric car docking (37%) security sys. [2] (30%) geothermal heat/cool[1] (60%) smart thermostats[1, 2] (47%) Energy Star products[1, 2] (48%) tankless water heater (43%) water staving		(15.7%) system upgrades (plumbing, electrical, HVAC, and major appliances) [1, 2]
Finish, fixture, or décor updates				
#13 living room updates – décor #14 bedroom updates[2] #15 living room updates–walls and floors[2]		(90%) LED lighting[1, 2]		(11.8%) interior replacements (flooring, wall coverings, and ceilings) [2]
Notes: 1) Energy efficient upgrade, 2) Aligns with AIP upgrade				

Appendix B: AIP Assistive Devices Found in Research

Boomer Willingness To Adopt AIP Devices (Ahn et al., 2008)	**Boomer Willingness To Adopt AIP Devices** (Philips, 2014b)	**Boomer AIP Home Renovations** (Merrill Lynch, 2014)	**Architectural Client Incorporated AIP Features** +(Baker, 2012) (Baker, 2014a) - (Baker,2014b)	**Boomer AIP Home Renovations** +(JCHS, 2014a) (JCHS,2015)
Exterior materials and features; walks, spaces, and structures; and landscaping				
(70%) remote garage door openers[2]	(58%) low-maintenance exterior[2]		(55%) exterior and interior access (60%) low irriga-tion landscaping[2]	(44.9%) no-step entries
Security and safety				
(32%) burglar alarm[2] (21%) gas detector[2] (2%) flood alarm (0.5%) video phone at entrance (0%) video recognition door opener[2]	(53%) security alarm[2]		(36%) exterior and security lighting[2]	
Overall floor plan, horizontal and vertical circulation, and finish or fixture updates				
(16%) remote controls - lights or dimming[2]	(54%) 1st floor master bedroom and baths (54%) effective lighting through-out the house[2]	(9%) renovating to make it easier to get around (7%) installing ramp, lift, or elevator to avoid climbing stairs	(65%) in-home accessibility features (47%) single- floor layout (55%) exterior and interior access (55%) exterior and interior access	(10.2%) wide doors and halls +(8%) lever-style door and faucet handles (76.5%) bed-room and full bath on entry lvl. +(76%) single-floor living +(44%) access-ible elec. controls (0.5%) in-home elevator (61.3%) no steps between rooms
Notes: 1) Energy efficient upgrade, 2) General renovation using standard products				

AIP Assistive Devices Found in Research (cont.)

Boomer Willingness To Adopt AIP Devices (Ahn et al., 2008)	**Boomer Willingness To Adopt AIP Devices** (Philips, 2014b)	**Boomer AIP Home Renovations** (Merrill Lynch, 2014)	**Architectural Client Incorporated AIP Features** +(Baker, 2012) (Baker, 2014a)	**Boomer AIP Home Renovations** +(JCHS, 2014a) (JCHS,2015)
Kitchen				
		(5%) installing lower counters for easier access	+(35%) universal kitchen features	(32.3%) wheel-chair accessible kitchens +(8%) lever-style door and faucet handles
Bath				
	(48%) bathroom handrails	(28%) handrails and grab bars and walk-in showers	+(54%) universal bath features (57%) +(60%) doorless or no-threshold showers[2] +(33%) hand held shower[2]	+(8%) of units with door or faucet levers[2] (42.1%) wheelchair accessible bathrooms
Appliances				
(98%) microwave[2]	(58%) stovetops/ ovens automatic shutoff[2]			
Products and devices				
(0.5%) remote control raise/ lower shutters[2] (49%) laptop[2] (26%) PDAs personal digital assistant		(58%) home maintenance tech e.g. cleaning robots, heated drive-ways[2]		
Communication and entertainment				
(88%)cell phone[2] (52%) fax[2] (27%) satellite TV[2] (93%) VHS player (90%) CD player[2] (0.5%) video phone[2] (19%) home theater system[2]	(63%) high speed internet[2] (49%) WiFi[2]			
Notes: 1) Energy efficient upgrade, 2) General renovation using standard products				

AIP Assistive Devices Found in Research (cont.)

Boomer Willingness To Adopt AIP Devices (Ahn et al., 2008)	**Boomer Willingness To Adopt AIP Devices** (Philips, 2014b)	**Boomer AIP Home Renovations** (Merrill Lynch, 2014)	**Architectural Client Incorporated AIP Features** (Baker, 2014a)	**Boomer AIP Home Renovations** (JCHS,2015)
System upgrades				
(1%) remote control for home appliances[2] (18%) remote control -temp. & humidity[1, 2]	(50%) auto-mated thermo-stat[1, 2] (46%) single remote to control and manage home[2]	(80%) tech. to reduce home ex-penses e.g. apps to control appli-ances[1] or smart thermo-stats[2] (80%) app appliance control, smart thermo-stat[1, 2]		
Health monitoring equipment				
(3%) health diagnostic system (2%)emergency alert product (0%) wireless health monitoring				
Additions				
			- (39%) au pair[2]/ in-law suite	
Notes: 1) Energy efficient upgrade, 2) General renovation using standard products				

Appendix C: Fifteen AIP Priority Features Compared to Research Findings

Fifteen Priority Features Compared to Research Findings				
15 Prioritized AIP Features (Center for Universal Design, 2006)	**DTS-2 Individual Pre-Test Comparable Device Terminology**	**DTS-2 Awareness**	**DTS-3 Individual Test (AIP Checklist) Comparable Device Terminology**	**DTS-3 Awareness**
Entrances				
1 - One entrance without steps and a flat or very low threshold	• No-step entry • Low threshold • Ramps	• 7%; n=1 • 7%; n=1 • 93%; n=14	• Not in AIP Checklist • ... beveled threshold • Ramps with handrails and landings ... wheelchair maneuverability.	• Not in AIP Checklist • 60%; n=9 • 60%; n=9
2- Minimum 60" by 60" level maneuvering space at stepless entrance (roof over entrance offers additional convenience)	• Wheelchair maneuverability • Covered entrance	• 0%; n=0 • 0%; n=0	• ...landings with wheelchair maneuverability • A covered, accessible entry area	• 60%; n=9 • 60%; n=9
General Interior				
1- Passage doors 32" clear (typically provided with 36" door)	• Wider doorways	• 27%; n=4	• Wide navigation space at ... doors to allow assisted walking or wheelchair space.	• 73%; n=11
* 1- Single level living	• Single level living	• 7%; n=1	• Single-floor living (no steps) with kitchen, laundry, bedroom, full bath, and living room on grade floor.	• 80%; n=12
2- Hall widths of 42" (where possible)	• Min. access. hall width	• 0%; n=0	• Wide navigation space at walkways ... to allow assisted walking or wheelchair space.	• 73%; n=11
2- Maneuvering space at doors—if inswinging door obstructs a bathroom or kitchen fixture or appliance, use offset hinges, swing door out, hinge door on opposite jamb, or widen doorway	• Accessible maneuvering space at doors	• 0%; n=0	• Not in AIP Checklist	• Not in AIP Checklist
2- Increased number of electrical outlets for additional lighting and alarm indicators, especially in bedrooms	• Additional electrical outlets • Additional lighting • Alert devices	• 0%; n=0 • 13%; n=2 • 20%; n=3	• Not in AIP Checklist • Increased lighting levels: Multi-bulb fixtures or higher wattage bulbs. • Not in AIP Checklist	• Not in AIP Checklist • 73%; n=11 • Not in AIP Checklist
Kitchens				
1- Clear floor space in kitchens; many configurations possible, 60" minimum turning circle recommended	• Wheelchair maneuvering space	• 0%; n=0	• Wide navigation space at walkways ... to allow assisted walking or wheelchair space.	• 73%; n=11
2- Adaptable cabinets to reveal kneespace at sink and under work surface near cooking appliance	• Adaptable, accessible sinks & cabinets	• 27%; n=4	• Varied height kitchen and bathroom counters or tables for seated work or grooming.	• 53%; n=8
Bathrooms				
1- Clear floor space in room; modest increase in room size beyond 5' X 8'	• Wheelchair maneuvering space	• 0%; n=0	• Extra square footage at toilet, sink, and tub for wheelchair maneuverability.	• 80%; n=12
2- Adaptable cabinets with under sink kneespace	• Adaptable, accessible sinks or cabinets	• 27%; n=4	• Varied height kitchen and bathroom counters or tables for seated work or grooming.	• 53%; n=8
2- Broadly applied bands of blocking (reinforcement) inside walls around toilets and bathing fixtures for future installation of grab bars	• Wall blocking • Grab bars	• 0%; n=0 • 73%; n=11	• Grab bars at the toilet and tub or shower with supportive wall blocking for 250-300 lbs.	• 80%; n=12
2- Toilet in a 48" X 56" space with centerline of toilet 18" from sidewall	• Assistive toilet	• 60%; n=9	• Extra square footage at toilet...for wheelchair maneuverability. • Mounting not provided	• 80%; n=12 • 0%; n=0
2- Curbless showers, built-ins a min. 36" X 60"	• Walk-in or roll-in shower	• 47%; n=7	• A shower stall, curbless, or walk-in shower.	• 80%; n=12
3- Offset controls in tub or shower to minimize stooping, bending, and reaching	• Offset tub or shower controls	• 0%; n=0	• Touch or lever handled plumb-ing fixture controls ...and a handheld shower hose with mounting capability from a seated position.	• 73%; n=11

Notes:
1 – Priority one features are given higher priority than other AIP features so that wheelchair bound individuals or those using other mobility devices can safely and independently enter and exit a dwelling, and maneuver within the kitchen and bathroom.
2 - Priority two features, when incorporated into the dwelling, offer residents with children, a family member with a disability or an older adult the possibility of being safe and independent for as long as possible.
3 – Priority three features, are not required, but increase safety for all users.
* Single level living was added to this list because of the feature imperative nature to aging in place.

Appendix D: Five AIP Features in 1% of U.S. Housing Compared to Research Findings

Five AIP Features in 1% of U.S. Housing Compared to Research Findings				
5 AIP Features Found in 1% of U.S. Housing (JCHS, 2014a)	**DTS-2 Individual Pre-Test Comparable Device Terminology**	**DTS-2 Awareness**	**DTS-3 Individual Test (AIP Checklist) Comparable Device Terminology**	**DTS-3 Awareness**
No-step entry	• No-step entry • Ramps	• 7%; n=1 • 93%; n=14	• Not in AIP Checklist • Ramps with handrails and landings… wheelchair maneuverability.	• Not in AIP Checklist • 60%; n=9
Single-floor living	• Single level living	• 7%; n=1	• Single-floor living (no steps) with kitchen, laundry, bedroom, full bath, and living room on grade floor.	• 73%; n=11
Extra-wide doorways and halls	• Wider doorways • Wider hallways	• 27%; n=4 • 0	• Wide navigation space at walkways and doors to allow assisted walking or wheelchair space.	• 73%; n=11
Accessible electrical controls and switches	• Accessible Electrical outlets switches •	• 0%; n=0	• Not in AIP Checklist	• Not in AIP Checklist
Lever-style door and faucet handles	• Lever door handle • Lever faucet handles	• 13%; n=2 • 7%; n=1	• Steel exterior doors with lever door handle • Touch or lever handled plumbing fixture controls…	• 53%; n=8 • 73%; n=11

Appendix E: Workshop Introduction Materials

Introduction and Itinerary

The purpose of this study is to determine if ***you***, as a member of the ***boomer population***, associate stigma toward certain residential assistive devices used to upgrade your home for aging. You have been invited to be a part of this study because, as a boomer, ***you may have existing attitudes*** about implementing ***residential assistive upgrades*** to help with ***your in-home aging process***. This research will provide you with the opportunity to explore and express the feelings you may have toward residential assistive devices.

This study uses traditional questionnaires and ***design thinking*** methods to collect data. Design thinking is a design process that utilizes traditional and graphically based data collection methods to understand and work through complex problems. Those who understand the problem best, known as stakeholders, are the key to the process. Stakeholders explain and define the problem. They also think of possible means by which to solve the problem (ideate), create solutions (prototype) and then test them for viability.

To express ***your perspective*** on ***in-home aging upgrades***, work through the following design thinking strategies (DTS):

- DTS-1 Aging in Place Questionnaire to assess your understanding of the technical term and concept
- DTS-2 Bulls Eye Diagram to explore devices boomers may feel stigma toward
- DTS-3 Aging in Place Assistive Device Checklist to explore a range of expert
- DTS-4 Prototype and Evaluation to generate an educational prototype and evaluate it for possible stigma

The strategies are created to be delivered in sequence based on the itinerary below. You may pull the strategies out of the notebook, but take care not to mix them with other participant's materials and return them to the notebook at the completion of each strategy. The total study time will take approximately 1 hour and 35 minutes. Below is an itinerary with estimated completion times.

Itinerary

Amount of Time	**Sequence of Workshop Events**
5 mins	Introduction, Consent Form, and Demographics
5 mins	DTS-1 Aging in Place Questionnaire
25 mins	DTS-2 Bulls Eye Diagram, Reflection, and Stigma Questionnaire
30 mins	DTS-3 Aging in Place Checklist, Discussion, and Stigma Questionnaire
30 mins	DTS-4 Prototype and Evaluation
1 hour and 35 min.	**Total Time**

Introduction Board

Purpose of the Study

To determine if boomers associate ***stigma*** toward certain ***assistive devices*** for ***aging in place.***

Color Designated Post-it Note System

The study will ask you to write some information on color coded post-its based on the boomer sub-generation in which you were born. The instructions indicate when this is required and post-its are provided.

younger boomers (b. 1959 to 1964)	middle boomers (b. 1952 to 1958)	older boomers (b. 1946-1951)

Appendix F: Letter of Consent

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Title of Research: Education as a Means to Influence Stigma Toward Aging in Place Residential Assistive Devices

You are invited to participate in a research study to understand if you, as a member of the baby boomer generation, associate stigma toward residential assistive devices used to upgrade your home for aging. You have been invited to be a part of this study because you may have existing attitudes about implementing residential assistive upgrades. This research will provide you with the opportunity to explore and express the feelings you may have toward residential assistive devices.

The researchers in this study are Sharon Becker Hensley, a graduate student of Design Thinking in the Department of Design at Radford University and Dr. Joan Dickinson, advisor. This study uses traditional questionnaires and design thinking methods to collect data. Design thinking is a design process that utilizes traditional and graphically based data collection methods to understand and work through complex problems. It is different from other design processes, because it employs a user-centered approach. Those who identify with the problem, known as stakeholders, explain, define, ideate, prototype, and test solutions to the problem.

The participants sought in this study are 15 to 20 baby boomers born between 1946 and 1964. If you decide to be in the study, you will be asked to answer questionnaires, record data using post-it notes, and create a prototype for educating boomers on upgrading their homes for aging. For the prototype, you select the methods by which to create it such as narrative, notes, or drawings. It is a rough representation of your idea and neatness is not required. Data collection in group discussions will be audio recorded and photographs will also be taken to capture design thinking processes. The study will last approximately 1 hour and 35 minutes.

You can choose not to be in this study. If you decide to be in this study, you may choose not to answer certain questions or not participate in certain parts of this study. If at any time you want to stop participation in this study, you may stop without penalty.

There are no known risks beyond what you might experience in daily life, nor is there any cost or compensation associated with participating in this research study. The information you provide may better inform you, families, product manufactures, and building contractors on the types of devices needed in homes and the time frames in which they are expected. More importantly, it may also provide insight into educational

strategies that manufacturers, the residential housing industry, and contractors might need to adopt in educating boomer consumers about residential assistive devices.

As a participant in this study, you will remain anonymous and what you tell us will be kept private unless required by law. The only article associated with you will be this consent form. If you choose to participate, do not write your name on any workshop materials. No one will be able to identify you, your answers, or know whether you participated in this study. If we present or publish the results of this study, your name will not be linked in any way to what we present. Only the researchers will have access to the data during data collection and analysis. All responses will be kept private and will be stored in a locked file cabinet in a locked office.

If you have questions about this study, ask before you sign this form. If you have any questions later, you may talk with Dr. Joan Dickinson (1-540-831-6164), jidickins@radford.edu). If this study raised some issues that you would like to discuss with a professional, you may find a certified aging in place specialist at www.nahb.org under the CAPS Directory Listing tab.

This study has been approved by the Radford University Institutional Review Board for the Review of Human Subjects Research. If you have questions or concerns about your rights as a research subject or have complaints about this study, you should contact Dr. Dennis Grady, Dean, College of Graduate and Professional Studies, Radford University, dgrady4@radford.edu, (1-540-831-7163).

It is your choice whether or not to be in this study. What you choose will not affect any current or future relationship with Radford University. If all of your questions have been answered and you would like to take part in this study, then please sign below.

_____	_____	_____
Signature	Printed Name(s)	Date

I/We have explained the study to the person signing above, have allowed an opportunity for questions, and have answered all of his/her questions. I/We believe that the subject understands this information.

_____	_____	_____
Signature of Researcher(s)	Printed Name(s)	Date

Note: A signed copy of this form will be provided for your records.

Appendix G: Demographic Questionnaire

Demographic Questionnaire

Directions: As an individual, please mark your response to the following questions.

1. What is your gender?

❑ Male ❑ Female

2. Which boomer sub-group do you identify with?

❑ younger boomer born between 1959 to 1964
❑ middle boomer born between 1952 to 1958
❑ older boomer born between 1946 to 1951

3. What is or was your occupation or industry?

❑ Cleaning and Maintenance
❑ Design/Build
❑ Entertainment/Performer
❑ Food Preparation/Serving
❑ Hospitality
❑ Life or Physical Sciences
❑ Media and Communications
❑ Personal Care and Service
❑ Sales
❑ Transportation
❑ Other
❑ Community or Social Services
❑ Computer/Mathematical
❑ Education/Training/Library
Educator Type_____
❑ Healthcare
❑ Homemaker
❑ Legal Occupations
❑ Management/ Business/ Financial
❑ Military and Protective Service
❑ Production/Manufacturing
❑ Social Sciences

4. What is your individual income?

❑ Less than $19,999
❑ $20,000 to $49,999
❑ $50,000 to $79,999
❑ $80,000 to $149,999
❑ $150,000 or more

5. What is the highest degree or level of school you have completed?

- ❑ Some high school, no diploma
- ❑ High school graduate, or equivalent (GED)
- ❑ Some college credit, no degree
- ❑ Trade/technical/vocational training
- ❑ Associates degree
- ❑ Bachelor's degree
- ❑ Master's degree
- ❑ Professional degree
- ❑ Doctorate degree

6. Please specify your race.

- ❑ White
- ❑ Hispanic or Latino
- ❑ American Indian or Alaska Native
- ❑ Asian
- ❑ Black or African American
- ❑ Native Hawaiian or Other Pacific Islander
- ❑ Other

7. What is your marital status?

- ❑ Single
- ❑ In a relationship
- ❑ Married
- ❑ Divorced
- ❑ Widowed

8. Have you had or are you currently acquiring a familiarity with long-term care (elderly care) either by providing or financing care for someone else, or by receiving ongoing living assistance from a caregiver?

- ❑ Yes
- ❑ No

Appendix H: DTS-1 Aging in Place Questionnaire

DTS-1 Aging in Place Questionnaire

Directions: As an individual, answer the following question and then proceed to the next page.

1. I am familiar with the term aging in place.

❑ Strongly disagree ❑ Disagree ❑ Unsure ❑ Agree ❑ Strongly agree

------- Page Break ------

DTS-1 Aging in Place Questionnaire

Directions: As an individual, read the following definition.

Aging in Place: "The ability to live in one's own home and community safely, independently, and comfortably, regardless of age, income, or ability level" (CDC, 2013, ¶ 4). Aging in place is the technical term used by professionals and specialists. Successful aging in place requires installation of assistive devices.

Directions: As an individual after reading the definition for aging in place, continue the questionnaire. The next questions will examine your familiarity of the term aging in place. Please mark your responses below.

2. I have never heard of the term aging in place before now.

❑ Strongly disagree ❑ Disagree ❑ Unsure ❑ Agree ❑ Strongly agree

3. I was familiar with the concept of aging in place before now.

❑ Strongly disagree ❑ Disagree ❑ Unsure ❑ Agree ❑ Strongly agree

4. I feel not being aware of the technical term aging in place could limit others ability to find resources on aging in place assistive devices.

❑ Strongly disagree ❑ Disagree ❑ Unsure ❑ Agree ❑ Strongly agree

DTS-1 Aging in Place Questionnaire

Directions: As an individual, read the following definition and answer the questions as an individual.

Stigma: Undesirable characteristics that bring about negative feelings or associations toward someone, something, or some circumstance.

5. I associate stigma with the term aging in place.

❑ Strongly disagree ❑ Disagree ❑ Unsure ❑ Agree ❑ Strongly agree

6. I associate stigma with the concept of aging in place.

❑ Strongly disagree ❑ Disagree ❑ Unsure ❑ Agree ❑ Strongly agree

7. When talking to others about planning and upgrades to live in their home while they age, have you used the term aging in place? Why or why not?

8. What other terms or phrases have you used instead of aging in place when talking to others about planning and upgrades to live in their home as they age? By marking the box, indicate whether you feel stigma toward the term you listed.

Other Aging in Place Terms or Phrases I Use	Stigma
	❑ Stigma
	❑ Stigma
	❑ Stigma
	❑ Stigma
	❑ Stigma

Appendix I: DTS-2 Bulls-Eye Diagram and Questionnaire

DTS-2 Bulls-Eye Diagram

Step 1: List Residential Assistive Devices

When you think about aging in place, what are the assistive devices that first come to mind when preparing a home? In this study, assistive devices are defined as the products and architectural upgrades used to ready a ***home*** for aging in place. ***Not personal assistive devices*** such as hearing aids or assistive mobility devices. When upgrading the physical environment, however, accommodation must be made for personal assistive devices.

Directions:

A) On the sheet provided, list as many residential assistive devices for upgrading the home as you can think of for the next 3 minutes. List the items sequentially as you think of them without skipping spaces.
B) From the list you just made, record your devices onto the provided color of post-it notes that correspond to your generation. List one device per post-it.

younger boomers (b. 1959 to 1964)	middle boomers (b. 1952 to 1958)	older boomers (b. 1946-1951)

C) Unfold your answer sheet once and check the box that describes whether the device you are thinking of is mobile or permanent.
D) Unfold your answer sheet once again and check the box that describes whether you are thinking of is a standard product or an elderly/ disability specific product.
E) Unfold your answer sheet one last time and indicate the degree of stigma you feel have toward the device you listed. 1 = no stigma and 10 = most stigma.

DTS-2 List Assistive Devices

	A) In 3 minutes, list the residential assistive devices you are aware of:	C) The device or product I am thinking of is:	D) I am thinking of a device or product that is:	E) Degree of stigma toward the device. No Stigma = 1, Most = 10
1.		❑ Mobile ❑ Built-in	❑ Standard product ❑ Elderly/ disability	**No Most** **1 2 3 4 5 6 7 8 9 10**
2.		❑ Mobile ❑ Built-in	❑ Standard product ❑ Elderly/ disability	**No Most** **1 2 3 4 5 6 7 8 9 10**
3.		❑ Mobile ❑ Built-in	❑ Standard product ❑ Elderly/ disability	**No Most** **1 2 3 4 5 6 7 8 9 10**
4.		❑ Mobile ❑ Built-in	❑ Standard product ❑ Elderly/ disability	**No Most** **1 2 3 4 5 6 7 8 9 10**
5.		❑ Mobile ❑ Built-in	❑ Standard product ❑ Elderly/ disability	**No Most** **1 2 3 4 5 6 7 8 9 10**
6.		❑ Mobile ❑ Built-in	❑ Standard product ❑ Elderly/ disability	**No Most** **1 2 3 4 5 6 7 8 9 10**
7.		❑ Mobile ❑ Built-in	❑ Standard product ❑ Elderly/ disability	**No Most** **1 2 3 4 5 6 7 8 9 10**
8.		❑ Mobile ❑ Built-in	❑ Standard product ❑ Elderly/ disability	**No Most** **1 2 3 4 5 6 7 8 9 10**
9.		❑ Mobile ❑ Built-in	❑ Standard product ❑ Elderly/ disability	No Most 1 2 3 4 5 6 7 8 9 10
10.		❑ Mobile ❑ Built-in	❑ Standard product ❑ Elderly/ disability	**No Most** **1 2 3 4 5 6 7 8 9 10**
B)	**From the list you just made, record your devices onto post-it notes provided. List one device per post-it.**			

DTS-2 List Assistive Devices

	A) In 3 minutes, list the residential assistive devices you are aware of:	C) The device or product I am thinking of is:	D) I am thinking of a device or product that is:	E) Degree of stigma toward the device. No Stigma = 1, Most = 10
11.		❑ Mobile ❑ Built-in	❑ Standard product ❑ Elderly/ disability	**No Most** **1 2 3 4 5 6 7 8 9 10**
12.		❑ Mobile ❑ Built-in	❑ Standard product ❑ Elderly/ disability	**No Most** **1 2 3 4 5 6 7 8 9 10**
13.		❑ Mobile ❑ Built-in	❑ Standard product ❑ Elderly/ disability	**No Most** **1 2 3 4 5 6 7 8 9 10**
14.		❑ Mobile ❑ Built-in	❑ Standard product ❑ Elderly/ disability	**No Most** **1 2 3 4 5 6 7 8 9 10**
15.		❑ Mobile ❑ Built-in	❑ Standard product ❑ Elderly/ disability	**No Most** **1 2 3 4 5 6 7 8 9 10**
16.		❑ Mobile ❑ Built-in	❑ Standard product ❑ Elderly/ disability	**No Most** **1 2 3 4 5 6 7 8 9 10**
17.		❑ Mobile ❑ Built-in	❑ Standard product ❑ Elderly/ disability	**No Most** **1 2 3 4 5 6 7 8 9 10**
18.		❑ Mobile ❑ Built-in	❑ Standard product ❑ Elderly/ disability	**No Most** **1 2 3 4 5 6 7 8 9 10**
19.		❑ Mobile ❑ Built-in	❑ Standard product ❑ Elderly/ disability	No Most 1 2 3 4 5 6 7 8 9 10
20.		❑ Mobile ❑ Built-in	❑ Standard product ❑ Elderly/ disability	**No Most** **1 2 3 4 5 6 7 8 9 10**
B)	**From the list you just made, record your devices onto post-it notes provided. List one device per post-it.**			

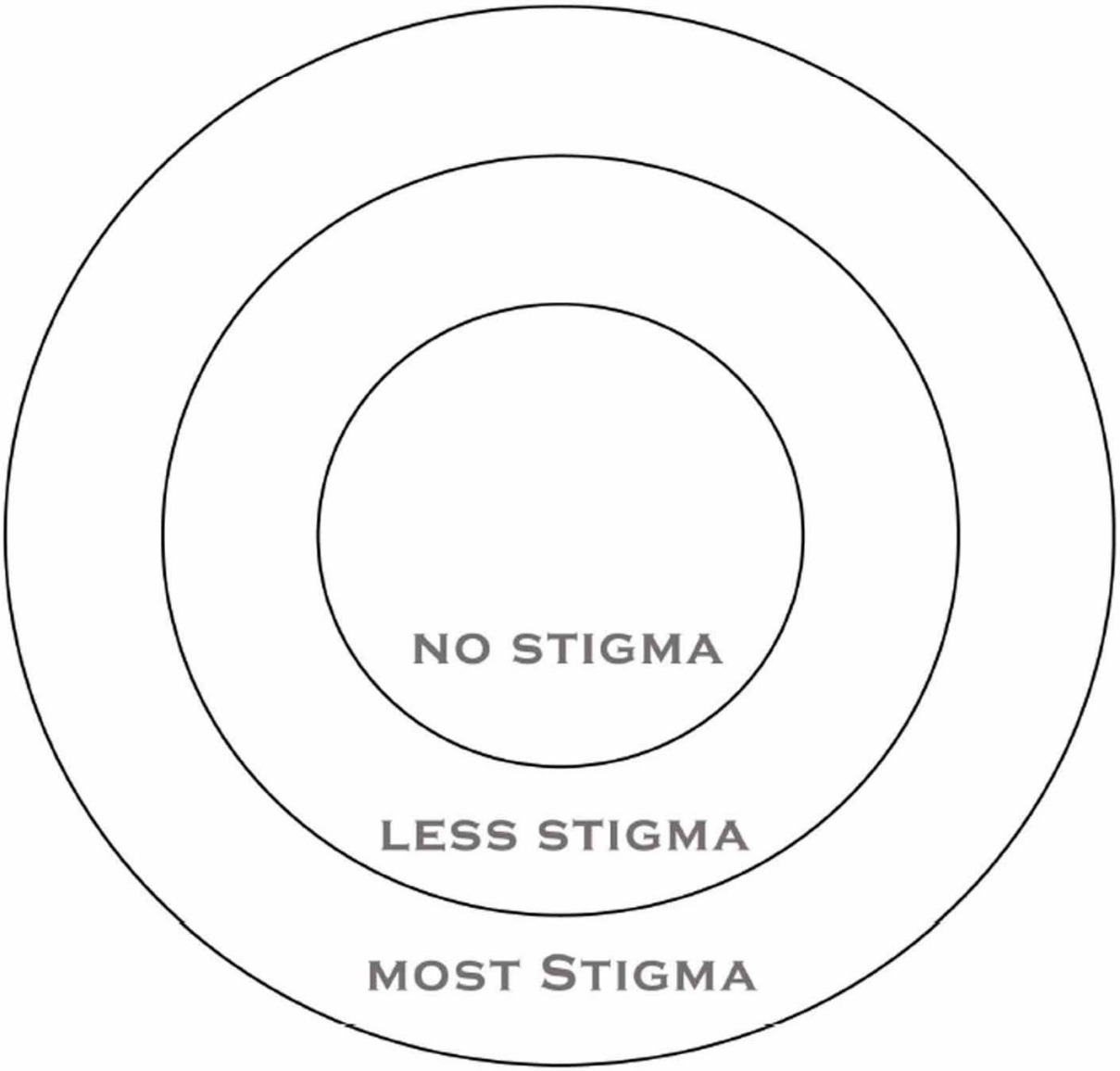
DTS-2 Bulls-Eye Diagram

Step 2: Discuss, Compile, and Record Degree of Stigma

Directions:

A) In a group exercise, sort and compile your post-its by grouping them based on device type.

B) Then, assign a degree of stigma ("no stigma", "less stigma", and "most stigma") to the groupings of devices by placing them on the Bulls-Eye diagram.



DTS-2 Reflection

Directions: Working as group, reflect on your post-it placements through the following questions. Discussion will be audio recorded.

1. **From the products you placed in the ring "no stigma", what characteristics about them create no feelings of negativity? List those characteristics here.**

2. **From the products you placed in the ring "less stigma", what characteristics about them create less feelings of negativity? List those characteristics below.**

3. **From the products you placed in the ring "most stigma", what about them creates more feelings of negativity? List those characteristics here.**

DTS-2 Stigma Questionnaire

Directions: The next questions will examine your familiarity and perceptions of stigma of assistive devices. Answer these questions as an individual without discussion.

1. **The presence of aging in place assistive devices in a home is an indication of disability, helplessness, or getting old.**

❑ Strongly disagree ❑ Disagree ❑ Unsure ❑ Agree ❑ Strongly agree

2. **Aging in place assistive devices are only for the elderly or disabled.**

❑ Strongly disagree ❑ Disagree ❑ Unsure ❑ Agree ❑ Strongly agree

3. **I associate stigma with most aging in place assistive devices.**

❑ Strongly disagree ❑ Disagree ❑ Unsure ❑ Agree ❑ Strongly agree

4. **Stigma towards aging in place assistive devices has kept me from upgrading my home.**

❑ Strongly disagree ❑ Disagree ❑ Unsure ❑ Agree ❑ Strongly agree

5. **My unfamiliarity with aging in place assistive devices has contributed to my stigma.**

❑ Strongly disagree ❑ Disagree ❑ Unsure ❑ Agree ❑ Strongly agree

6. **Standard products or architectural devices are considered to be aging in place assistive devices.**

❑ Strongly disagree ❑ Disagree ❑ Unsure ❑ Agree ❑ Strongly agree

7. Safety within my home is important to me.

❑ Strongly disagree ❑ Disagree ❑ Unsure ❑ Agree ❑ Strongly agree

8. Installation of aging in place assistive devices makes homes safe.

❑ Strongly disagree ❑ Disagree ❑ Unsure ❑ Agree ❑ Strongly agree

9. Appearing not to be elderly or disabled is important to me.

❑ Strongly disagree ❑ Disagree ❑ Unsure ❑ Agree ❑ Strongly agree

10. Not appearing elderly or disabled is more important to me than ensuring my safety by upgrading my home with aging in place assistive devices.

❑ Strongly disagree ❑ Disagree ❑ Unsure ❑ Agree ❑ Strongly agree

Appendix J: DTS-3 AIP Assistive Device Checklist and Questionnaire

DTS-3 Aging in Place Assistive Device Checklist

Directions: Below is an abbreviated checklist of expert recommended aging in place assistive devices commonly considered for upgrading homes. The list is not inclusive of all possible upgrades, but is comprehensive enough for you to understand the various spaces and devices needed. Read through each item in the list and mark an **[X]** on the:

- Devices you associate **stigma** toward.
- Devices you were **aware** of being aging in place assistive devices.
- Devices you feel would be most important to **share** with another boomer.

Assistive Device Checklist	**Stigma:** **[X]** mark devices you feel stigma toward.	**Awareness:** **[X]** mark devices you were aware of.	**Share:** **[X]** mark important devices to share.
Exterior			
1. Low maintenance materials and a new roof.			
2. Driveway and exterior covered walkway (36" w, with direct access to main entry) that are hard surfaced, flat, and with no cracks.			
3. A covered, accessible entry area with a wider doorway, beveled threshold, and a surface for packages.			
4. Ramps with handrails and landings with area for wheelchair maneuverability.			
Security and Safety			
5. Steel exterior doors with lever door handle, easily operable deadbolts or security chains, and a lowered peephole or a sidelight.			
6. Computer or smart phone remote monitoring system with multi-user access for security, heat/air, lights, and appliances.			
Lighting			
7. Increased lighting levels: Multi-bulb lighting fixtures or higher wattage bulbs.			

Assistive Device Checklist	**Stigma:** **[X]** mark devices you feel stigma toward.	**Awareness:** **[X]** mark devices you were aware of.	**Share:** **[X]** mark important devices to share.
Overall Floor Plan			
8. Single-floor living (no steps) with kitchen, laundry, bedroom, full bath, and living room on grade floor.			
9. Wide navigation space at walkways and doors to allow assisted walking or wheelchair space.			
10. Lever door handles and pulls on cabinets or furniture that allow opening without pinching or twisting.			
11. Varied height kitchen and bathroom counters or tables for seated work or grooming.			
12. Touch or lever handled plumbing fixture controls, pull-out spray nozzle at kitchen, and a handheld shower hose with mounting capability from a seated position.			
13. Increased illumination via light paint colors			
Windows			
14. Easily operated windows and window hardware allowing non-forceful raising or lowering or access blocked by furniture or items.			
15. Low maintenance easy to operate window coverings (curtains, blinds, etc.) with access not blocked by furniture or items.			
Interior Flooring			
16. The same anti-slip flooring throughout with no transition strips. E.g. hard (wood, etc.), resilient (vinyl, etc.), or level loop carpet.			
Kitchen			
17. A pantry, base cabinets with drawers or pull out shelves, or taller upper cabinets mounted directly to base cabinets.			
18. Adequate counter or table space adjacent to or opposite the refrigerator, stove, and sink to set food containers or dishes.			

Assistive Device Checklist	**Stigma:** **[X]** mark devices you feel stigma toward.	**Awareness:** **[X]** mark devices you were aware of.	**Share:** **[X]** mark important devices to share.
Bathroom			
19. Extra square footage at toilet, sink, and tub for wheelchair maneuverability.			
20. Grab bars at the toilet and tub or shower with supportive wall blocking for 250-300 lbs.			
21. Built-in shower seat for the tub or shower.			
22. Moveable shower seat for the tub or shower.			
23. A shower stall, curbless, or walk-in shower.			
24. Therapeutic bathtub with a door.			
Bedroom			
25. Firmer mattress and mattress edge.			
Appliances			
26. Appliance controls located at the front (lockable for child safety), easy to read and understand, and large buttons or knobs with the ability to use without pinching, grasping, or forceful button pushing. Automatic shut-off or audible alarm at cycle completion, if left on, or left ajar.			
Products and Devices			
27. Seating with firmer foam cushions.			
28. Assistive recliner lift chair.			
29. Lighter weight vacuum and a steam mop.			
Physical Fitness			
30. A dedicated or impromptu exercise area.			
31. Exercise apps, videos, or video games.			
Communication			
32. Wireless high-speed Internet via a smart phone, hot spot, or service provider.			
33. Supplemental forms of communication such as video calling (Facetime or Skype) or a social media account (Facebook or Twitter).			

DTS-3 Discussion

Directions: In an individual exercise, reflect on your answers from the Aging in Place Checklist through the questions below.

1. **Overall, what are your comments or reflections in reference to the ratio of products you marked as feeling stigma toward versus those you did not?**

2. **Were there any aging in place assistive devices that caught your attention, for whatever reason, from the list, and why?**

3. **This list is not comprehensive of all possible aging in place devices. Are there any other devices you can think of? Please list them below. If you need additional space, flip over to the back.**

4. **For the predominant amount of Aging in Place Checklist devices, how would you categorize them based on the following?**

   - ❑ Specifically designed, produced, and marketed for the elderly or disabled.
   - ❑ Standard products with aging in place characteristics designated for anyone.

5. **How do the categorizations in the above question make you feel about aging in place and upgrading your home?**

6. **Do current standard product labeling, advertising, and manufacturer educational materials assist consumers with identifying and learning about <u>standard products</u> with aging in place characteristics? If not, how could aging in place product education be improved?**

7. **For the assistive devices you associated stigma toward, when in the aging in place process would you need to implement them?**

❑ Now ❑ 5 years ❑ 10 years ❑ 20 years ❑ Never
❑ Other, explain:

8. **For the assistive devices you did not associate stigma toward, when in the aging in place process could you implement them?**

❑ Now ❑ 5 years ❑ 10 years ❑ 20 years ❑ Never
❑ Other, explain:

9. **In a group discussion, compare your answers to the DTS-3 Discussion questions. Discussion will be audio recorded.**

DTS-3 Assistive Devices and Stigma Questionnaire

Directions: The next questions will examine your perceptions of aging in place assistive devices and how stigma influences your views. Prior to answering these questions, please read the definition for aging in place assistive devices.

Definition for Aging in Place Assistive Devices: "Any item, piece of equipment, or product system" selected specifically to be installed in the residence for aging in place, "whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities" (ATIA, n.d., ¶2). The item can be specifically manufactured for the purpose of assisting the elderly or disabled or it can be general products with aging in place characteristics.

1. I am familiar with the term aging in place.

❑ Strongly disagree ❑ Disagree ❑ Unsure ❑ Agree ❑ Strongly agree

2. I associate stigma with the <u>term</u> aging in place.

❑ Strongly disagree ❑ Disagree ❑ Unsure ❑ Agree ❑ Strongly agree

3. I associate stigma with the <u>concept</u> aging in place.

❑ Strongly disagree ❑ Disagree ❑ Unsure ❑ Agree ❑ Strongly agree

4. The presence of aging in place assistive devices in a home is an indication of disability, helplessness, or getting old.

❑ Strongly disagree ❑ Disagree ❑ Unsure ❑ Agree ❑ Strongly agree

5. Aging in place assistive devices are only for the elderly or disabled.

❑ Strongly disagree ❑ Disagree ❑ Unsure ❑ Agree ❑ Strongly agree

6. I associate stigma with most aging in place assistive devices.

❑ Strongly disagree ❑ Disagree ❑ Unsure ❑ Agree ❑ Strongly agree

7. Stigma towards aging in place assistive devices has kept me from upgrading my home.

❑ Strongly disagree ❑ Disagree ❑ Unsure ❑ Agree ❑ Strongly agree

8. My unfamiliarity with aging in place assistive devices has contributed to my stigma.

❑ Strongly disagree ❑ Disagree ❑ Unsure ❑ Agree ❑ Strongly agree

9. Standard products or architectural devices are considered to be aging in place assistive devices.

❑ Strongly disagree ❑ Disagree ❑ Unsure ❑ Agree ❑ Strongly agree

10. Aging in place assistive devices designated specifically for the elderly or disabled are quickly implemented, mobile or temporary, and imply disability, helplessness, and getting old.

❑ Strongly disagree ❑ Disagree ❑ Unsure ❑ Agree ❑ Strongly agree

11. Aging in place assistive devices designated for anyone are well planned, built-in or permanent, and do not imply disability, helplessness, and getting old.

❑ Strongly disagree ❑ Disagree ❑ Unsure ❑ Agree ❑ Strongly agree

12. Learning about standard products and upgrades with aging in place characteristics has helped me understand upgrading for aging in place includes very few products for the elderly or disabled.

❑ Strongly disagree ❑ Disagree ❑ Unsure ❑ Agree ❑ Strongly agree

Appendix K: DTS-4 Educational Prototype and Evaluation

Definitions

Aging in Place

"The ability to live in one's own home and community safely, independently, and comfortably, regardless of age, income, or ability level" (CDC, 2013, ¶ 4). Aging in place is the technical term professionals and specialists in the field use. Successful aging in place requires installation of assistive devices.

Aging in Place Assistive Devices

"Any item, piece of equipment, or product system" selected specifically to be installed in the residence for aging in place, "whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities" (ATIA, n.d., ¶2). The item can be specifically manufactured for the purpose of assisting the elderly or disabled or it can be standard products with aging in place characteristics.

Design Thinking Methods

Design thinking is a user-centered approach to understand and work through complex problems using graphically based data collection methods. It is different from other design and research processes, because it uses those who identify with the problem, known as stakeholders, to explain, define, ideate, prototype, and test solutions to the problem.

Stigma

Undesirable characteristics that bring about negative feelings or associations toward someone, something, or some circumstance.

DTS-4 Educational Prototype and Evaluation

Introduction: Aging in place, for the 91% of boomers who desire it, requires installation of residential assistive devices in order to offset the inevitable physical and mental decline that comes with aging. Upgrades are required because only 1% of U.S. homes have five or fewer aging in place features. Currently, 59% of boomers are not interested in aging in place upgrades and cite cost, disinterest, and not knowing where to start as reasons.

With this information in mind, along with what you already know and have learned about residential assistive devices, imagine you had to **create *"something"*** that can ***easily reach, succinctly teach, provide additional resources, and have the greatest impact on your peers, boomers aged 52 to 70, about upgrading their homes for aging in place.***

Step 1: Individual Aging in Place Ideas

Directions: Conduct this first step as an individual. List the aging in place ***ideas*** you feel are ***most important*** for educating boomers for preparing a home for aging in place. *You may condense ideas in any way to suit you or list checklist items verbatim. You have already started this exercise by indicating the importance for* ***sharing*** *particular aging in place features from the Aging in Place Assistive Device Checklist. If you require more space, use the back of the sheet.*

Idea 1/ Reason:

Idea 2/ Reason:

Idea 3/ Reason:

Idea 4/ Reason:

Idea 5/ Reason:

Step 2: Group Aging in Place Ideas

Directions: Discuss your individual aging in place upgrade ideas with your fellow participants.

A) As a group, select or combine ideas generated from individual lists that could have the ***most impact*** on you and your boomer peers. Record group ideas below.
B) After discussion, assign a priority by number to the ideas based on their ***order of importance of being presented within an educational prototype***.

A) Aging in Place Group Ideas	B) Prioritize
Idea:	
Idea:	
Idea:	
Idea:	
Idea:	
Idea:	
Idea:	
Idea:	

Step 3: Other Decisions for the Educational Prototype

Directions: In individual and group exercises, decide the following about your prototype. Have one group member record the answers.

1. **As an individual, list the types of educational prototypes you think would best benefit boomers?**

2. **As a group, discuss your individual prototype ideas, select one, and list it below.**

3. **As a group, describe <u>how</u> and <u>when</u> the educational prototype should be delivered to boomer consumers. Record your decisions below.**

------- Page Break ------

DTS-4 Illustrate an Educational Prototype

Directions: Through your choice of medium (narrative, notes, bullet points, or drawings), roughly illustrate what your educational prototype would look like and/or how it would function. Additional pages are provided for this purpose to directly create on or to attach ideas to.

DTS-4 Prototype Evaluation

Directions: As a group, evaluate what you have created including your **individual and group aging in place ideas** and your **group prototype** based on the following questions. Record your answers to the following questions. Use the back of the sheet if you require additional space.

1. **Do any of the ideas you created evoke stigma? If so, which ones and why did you use them?**

2. **When creating the ideas, did you use positive language as a means to influence stigma? Why or why not?**

3. **Did any of the ideas address urgency or the need to upgrade?**

4. **Did you concentrate on any specific areas within the home? If so, list the specific area(s).**

5. **Do any of the ideas address phasing or segmenting installation time of aging in place upgrades?**

6. **What would you change about your educational prototype and why?**

Appendix L: Pre-test AIP Assistive Devices Results

DTS-2 Pre-Test Individual AIP Device Results				
30 Participant Listed Devices	**% Awareness**	**Rank & Frequ. Participants Listed Device**	****% Stigma**	****Average Stigma**
Ramp	93%; n=14	1st =4, 2nd=5, 3rd=1, 4th=2, 6th & 8th = 1	79%; n=11/14	4.21
Grab bars	73%; n=11	1st=6, 2nd=3, 8th & 9th = 1	45%; n=5/11	3.27
Assistive Toilet (built-in or taller) & mobile potty chair)	60%; n=9 (built-in, 33%; n=5) (potty, 27%; n=4)	2nd, 3rd, 4th=1; 5th =2; 6th=2; 10th=2	78%; n=7/9 (predominately potty chair)	4.67 (built-in, 2.8) (potty chair, 7)
Walk-in shower	47%; n=7	1st=2, 2nd=2, 3rd=3,	29%; n=2/7	1.43
Handrails	40%; n=6	3rd, 4th, 5th=1; 7th=2; 9th=1	33%; n=2/6	1.5
Lower counter/ sink	27%; n=4	1st, 3rd=1; 4th=2	50%; n=2/4	3
Stair chair lift	27%; n=4	1st, 3rd, 7th, 8th =1	75%; n=3/4	4.25
Shower chair (built-in & mobile)	27%; n=4 (built-in n=3)	2nd=2, 4th & 6th =1	100%; 4/4 or (predominately built-in)	4 (built-in, 4.3) (mobile, 3)
Wider doors	27%; n=4	3rd, 5th, 7th, 8th =1	25%; n=1/4	1.5
Assistive Floor (throw rug removal, non-slip & hardwood)	27%; n=4 (rug n=1, non-slip n=2, & hardwd n=1)	5th, 9th, 13th, 14th =1	75%; n=3/4 (rug removal & non-slip)	4.25
Therapeutic tub	20%; n=3	1st=1, 2nd=2	100%; n=3/3	6
Emergency alert	20%; n=3	3rd, 6th, 17th=1	67%; n=2/3	4.33
Assistive Seating (recliner lift chair & higher seats)	20%; n=3 (lift chair n=2)	4th=2, 6th=1	67%; n=2/3 (lift chair)	4.67 (lift chair 6.5)
Lighting (brighter, ex-tended life bulbs)	13%; n=2 (brighter n=1, extended n=1)	*	50%; n=1/2 (brighter)	*
Assistive bed	13%; n=2	*	0%; n=0	*
Lever door handles	13%; n=2	*	0%; n=0	*
General Notes:				
1. The following devices were listed by one person: appliances, technology (Ring Doorbell ® & Alexa®), pull-out base cabinet shelves, level thresholds, easily operable windows, lever faucet, caregiver living area, no step entry, fire safety, bathroom telephone, single level living, hand held shower, lift sling, automatic door.				
2. Total population for all data is n=15, unless otherwise noted.				
3. *Values with less than two participant responses were not calculated for reason of validity. Those included were provided for information only.				
4. **Stigma was calculated by using those in DTS-2 who expressed a stigma rating between 2=low stigma to 10=most stigma. In the scale, 1=no stigma was not included.				

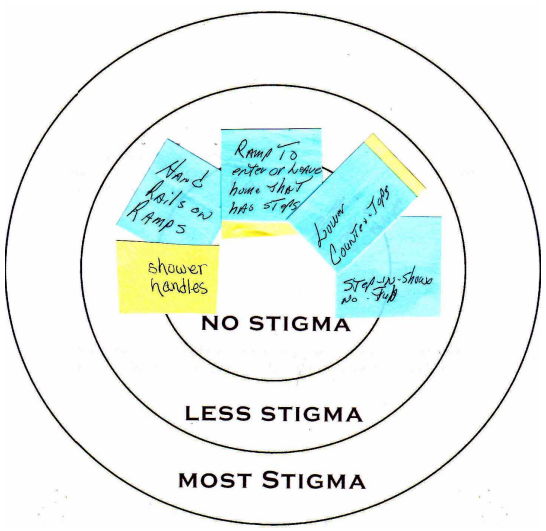
Appendix M: Pretest and Test AIP Device Knowledge and Stigma Comparison

DTS-2 Pre-Test AIP Device Results				DTS-3 Test Individual AIP Device Results			
Devices Listed	**Individual Awareness**	**Individual Stigma**	**Group Stigma**	**AIP Checklist Description**	**Individual Awareness**	**Individual Stigma**	**Peer Sharing**
Exterior							
-	-	-		1. Low maintenance materials and a new roof.	20%; n=3	7%; n=1	73%; n=11
-	-	-		2. Driveway and exterior covered walkway (36" width, with direct access to main entry) that are hard surfaced, flat, and with no cracks.	60%; n=9	0%; n=0	73%; n=11
Level thresholds	7%; n=1	0%; n=0		3. A covered, accessible entry with a wider doorway, beveled threshold, a surface for items.	60%; n=9	7%; n=1	67%; n=10
Ramp	93%; n=14	79%; n=11/14	No stigma 1/6 Less stigma 3/6 Most stigma 2/6	4. Ramps with handrails and landings with wheelchair maneuverability.	60%; n=9	73%; n=11	40%; n=6
Handrails	40%; n=6	33%; n=2/6	No stigma 4/6 Less stigma 2/6	-	-	-	-
No-step entry	7%; n=1	0%; n=0	No stigma 1/1	-	-	-	-
Security and Safety							
-	-	-		5. Steel exterior doors with lever door handle, easily operable deadbolts or security chains, and a lowered peephole or a sidelight.	60%; n=9	0%; n=0	67%; n=10
-	-	-		6. Computer or smart phone remote monitoring system with multi-user access for security, heat/air, lights, and appliances.	40%; n=6	0%; n=0	73%; n=11
Emergency alert	20%; n=3	67%; n=2/3		-	-	-	-
Fire safety	7%; n=1	0%; n=0		-	-	-	-
Ring Doorbell®	7%; n=1	0%; n=0		-	-	-	-
Overall Floor Plan							
Devices Listed	**Individual Awareness**	**Individual Stigma**	**Group Stigma**	**AIP Checklist Description**	**Individual Awareness**	**Individual Stigma**	**Peer Sharing**
Single-level living	7%; n=1	0%; n=0	No stigma 1/1	7. Single-floor living (no steps) with kitchen, laundry, bedroom, full bath, and living room on grade floor.	80%; n=12	0%; n=0	73%; n=11
Wider doors	27%; n=4	25%; n=1/4	No stigma 3/3	8. Wide navigation space at walkways and doors to allow assisted walking or wheelchair space.	73%; n=11	0%; n=0	53%; n=8
Lever door handles	13%; n=2	0%; n=0	No stigma 2/2	9. Lever door handles and pulls on cabinets or furniture allowing opening without pinching or twisting.	53%; n=8	0%; n=0	60%; n=9
Lower counter/ sink	27%; n=4	50%; n=2/4	No stigma 2/3 Most stigma 1/3	10. Varied height kitchen and bathroom counters or tables.	53%; n=8	33%; n=5	33%; n=5
Lever faucet handles Hand held shower head	7%; n=1 7%; n=1	0%; n=0 0%; n=0	No stigma 1/1	11. Touch or lever handled plumbing fixture controls, pull-out spray nozzle at kitchen, and a handheld shower hose with mounting capability from a seated position.	73%; n=11	20%; n=3	47%; n=7
Lighting (brighter, exten. life bulbs)	13%; n=2 (brighter n=1, extended n=1)	50%; n=1/2 (brighter)	No stigma 2/2	12. Increased lighting levels: Multi-bulb fixtures or higher wattage bulbs.	73%; n=11	0%; n=0	53%; n=8
-	-	-		13. Increased illumination via light paint colors	40%; n=6	0%; n=0	60%; n=9
Easily operable windows	7%; n=1	0%; n=0	No stigma 1/1	14. Easily operated windows and window hardware allowing non-forceful raising or lowering or access blocked by furniture or items.	47%; n=7	0%; n=0	80%; n=12
-	-	-		15. Low maintenance, easy to operate window coverings (curtains, blinds, etc.) with access not blocked by furniture or items.	67%; n=10	0%; n=0	60%; n=9
Assistive Floor (throw rug removal, non-slip & hardwood)	27%; n=4 (rug n=1, non-slip n=2, & hardwd n=1)	75%; n=3/4 (non-slip & rug remove	No stigma 3/4 Less stigma 1/4 (non-slip)	16. The same anti-slip flooring throughout with no transition strips. E.g. hard (wood, etc.), resilient (vinyl, etc.), or level loop carpet.	47%; n=7	13%; n=2	67%; n=10
Kitchen							
Pull-out base cabinet shelving	7%; n=1	0%; n=0		17. A pantry, base cabinets with drawers or pull out shelves, or taller upper cabinets mounted directly to base cabinets.	60%; n=9	7%; n=1	60%; n=9
-	-	-		18. Adequate counter or table space adjacent to or opposite the refrigerator, stove, and sink to set food containers or dishes.	53%; n=8	7%; n=1	60%; n=9
Bathroom							
-	-	-		19. Extra square footage at toilet, sink, and tub for wheelchair maneuver.	80%; n=12	13%; n=2	47%; n=7
Grab bars	73%; n=11	45%; n=5/11	No stigma 2/6 Less stigma 4/6	20. Grab bars at the toilet, tub & shower with blocking for 250-300 lbs.	80%; n=12	40%; n=6	40%; n=6

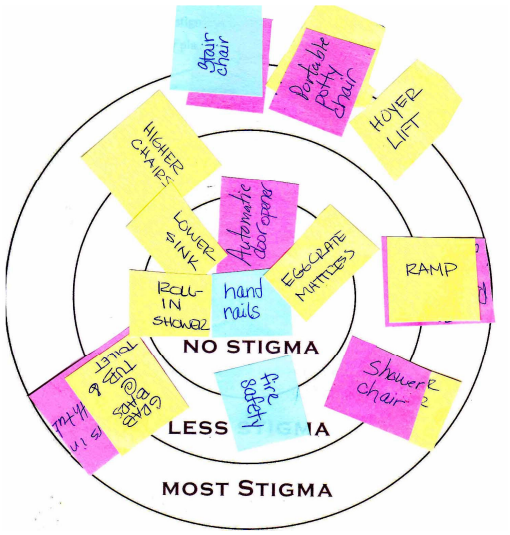
Pretest and Test AIP Device Knowledge and Stigma Comparison (cont.)

Bathroom con't							
Devices Listed	**Individual Awareness**	**Individual Stigma**	**Group Stigma**	**AIP Checklist Description**	**Individual Awareness**	**Individual Stigma**	**Peer Sharing**
Shower chair (built-in)	20%; n=3	100%; n=3/3	No stigma 2/3 Less stigma 1/3	21. Built-in shower seat for the tub or shower.	87%; n=13	7%; n=1	27%; n=4
Shower chair (mobile)	7%; n=1	0%; n=0	Less stigma 1/1	22. Moveable shower seat for the tub or shower.	60%; n=9	60%; n=9	20%; n=3
Walk-in/ step-in shower	47%; n=7	29%; n=2/7	No stigma 5/5	23. A shower stall, curbless, or walk-in shower.	80%; n=12	0%; n=0	40%; n=6
Therapeutic tub	20%; n=3	100%; n=3/3	No stigma 1/3 Less stigma 1/3 Most stigma 1/3	24. Therapeutic bathtub with a door.	47%; n=7	40%; n=6	53%; n=8
Assistive Toilet (mobile potty chair)	20%; n=3	100%; n=3/3	Most stigma 2/2		-	-	-
Assistive Toilet (built-in or taller)	40%; n=6	67%; n=4/6	No stigma 2/5 Less stigma 2/5 Most stigma 1/5				
Bedroom							
Assistive bed	13%; n=2	0%; n=0		25. Firmer mattress and mattress edge.	60%; n=9	7%; n=1	47%; n=7
Appliances							
Appliances	7%; n=1	0%; n=0	No stigma 1/1	26. Appliance controls located at the front (lockable for child safety), easy to read and understand, and large buttons or knobs with the ability to use without pinching, grasping, or forceful button pushing. Automatic shut-off or audible alarm at cycle completion.	60%; n=9	0%; n=0	60%; n=9
Products and Devices							
				27. Seating with firmer foam cushions.	67%; n=10	0%; n=0	53%; n=8
Assistive Seating (higher seats & recliner lift chair)	20%; n=3 (higher n=1, lift n=2)	67%; n=2/3 (lift chair)	Less stigma 1/1 (Higher seats) Most stigma 1/1 (Lift chair)	28. Assistive recliner lift chair.	87%; n=13	40%; n=6	13%; n=2
-	-	-		29. Lighter weight vacuum and a steam mop.	53%; n=8	0%; n=0	40%; n=6
Stair chair lift	27%; n=4	75%; n=3/4	No stigma 1/4 Most stigma 3/4	-	-	-	-
Alexa ® voice command internet search	7%; n=1	0%; n=0		-	-	-	-
Lift sling	7%; n=1	7%; n=1/1		-	-	-	-
Physical Fitness							
-	-	-		30. A dedicated or impromptu exercise area.	40%; n=6	0%; n=0	40%; n=6
-	-	-		31. Exercise apps, videos, or video games.	40%; n=6	0%; n=0	40%; n=6
Communication							
-	-	-		32. Wireless high-speed Internet via a smart phone, hot spot, or service provider.	60%; n=9	0%; n=0	47%; n=7
-	-	-		33. Supplemental forms of communication such as video calling (Facetime or Skype) or a social media account (Facebook or Twitter).	67%; n=10	0%; n=0	20%; n=3
Bathroom telephone	7%; n=1	0%; n=0		-	-	-	-
General Notes							
1. Where this symbol is present (-), the AIP Device was not mentioned by a participant in the pre-test or detailed as an AIP device in the test.							
2. Total population for all data is n=15, unless otherwise noted.							

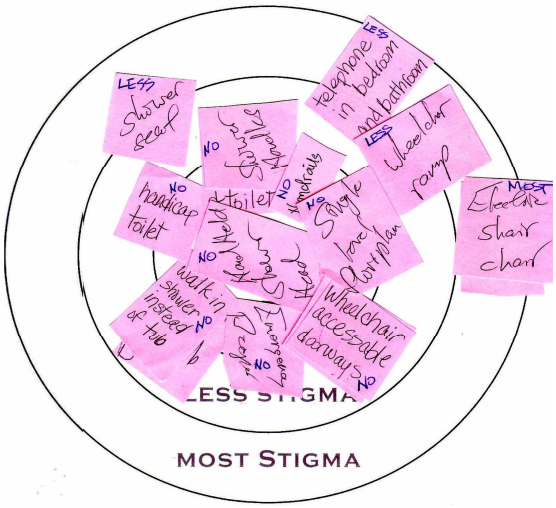
Appendix N: Group DTS-2 Bulls-Eye Diagram Results



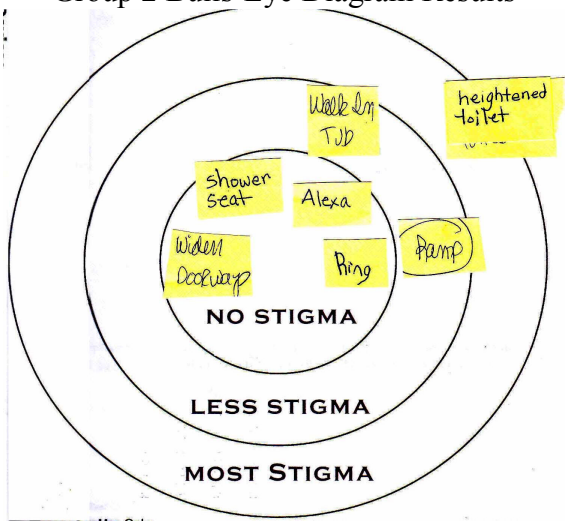
Group 1 Bulls-Eye Diagram Results



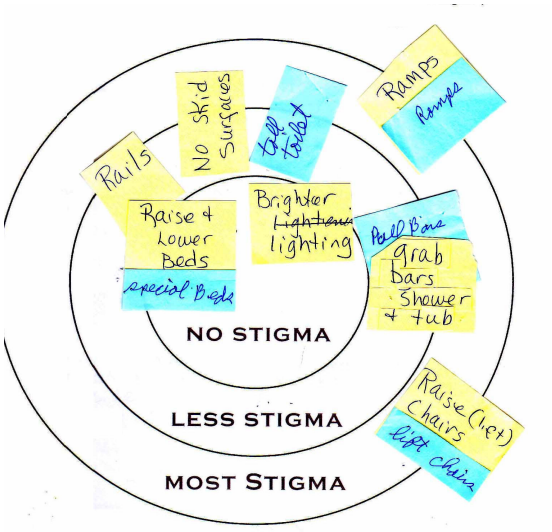
Group 2 Bulls-Eye Diagram Results



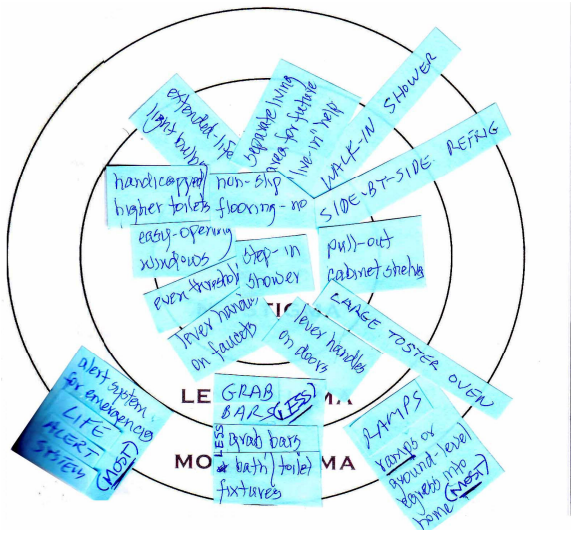
Group 3 Bulls-Eye Diagram Results



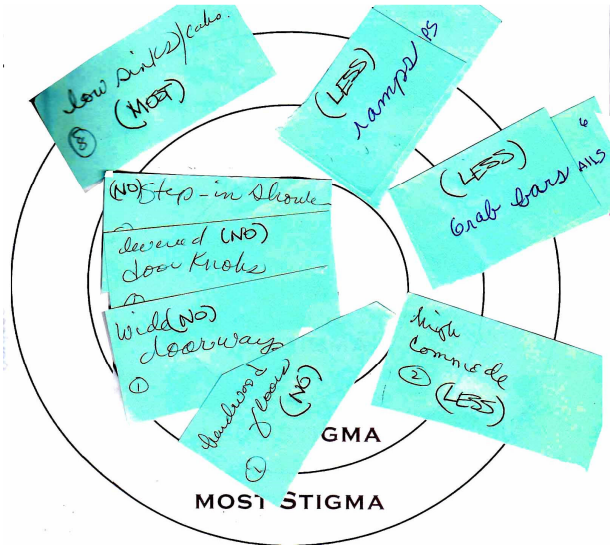
Group 4 Bulls-Eye Diagram Results



Group 5 Bulls-Eye Diagram Results



Group 6 Bulls-Eye Diagram Results



Group 7 Bulls-Eye Diagram Results

Appendix O: Group 2 Prototype

Group 2 Prototype – Product Label

Step 1: Individual Aging in Place Ideas

Idea 1/ Reason: Something to teach boomers about the different kinds of devices available.

Idea 2/ Reason: something that provides descriptions of what makes a device aging in place

Step 1: Individual Aging in Place Ideas

Idea 1/ Reason: any thing to stay in our home is beneficial to boomers.

Idea 2/ Reason: Stair lifts

Idea 3/ Reason: bathroom fixtures that are safer, easy to use.

Idea 4/ Reason: All walkway should have hand rails. A must to prevent falls.

Idea 5/ Reason: good lighting a must!

Step 1: Individual Aging in Place Ideas

Idea 1/ Reason: PUBLIC SERVICE TV & RADIO COMMERCIALS, MAGAZINE ADS IN AARP, REDBOOK, LADIES HOME JOURNAL & OTHER JOURNALS TARGETING THIS DEMOGRAPHIC

Idea 2/ Reason: AN EASILY RECOGNIZABLE SYMBOL ON LABELS

Idea 3/ Reason: BETTER EDUCATE DESIGNERS, BUILDERS, & PREPARE FOR CAPS.

Step 2: Group Aging in Place Ideas

Idea: HOME SAFETY & SECURITY

Idea: EASE AND PHYSICAL SAFETY OF LIVING ENVIRONMENT.

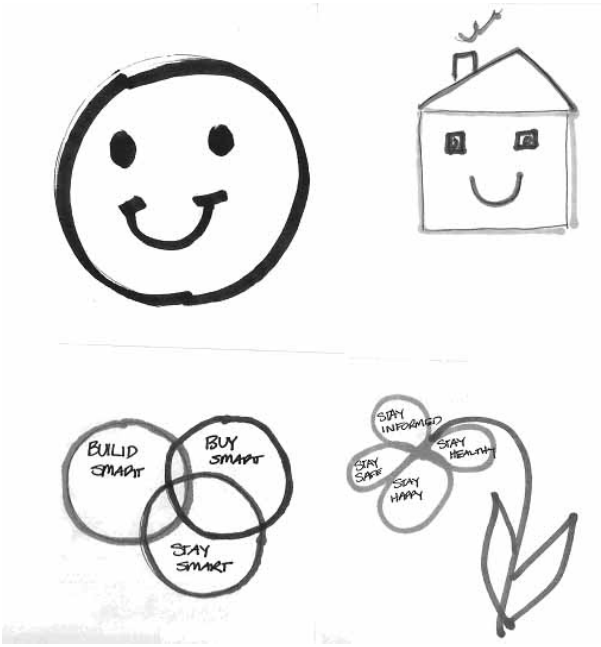
Idea: PRODUCT LABEL

DTS-4 Illustrate an Educational Prototype

These are some ideas for posters in Dr's offices, community centers, sides of buses and in hardware and big box stores:

- Education means safety
- Stay Safe!!
- Learn to stay safe
- Plan ahead by upgrading so, "I've fallen and I can't get up! does not become a reality
- Share what you know

Ideas for product labels



Appendix P: Group 3 Prototype

Group 3 Prototype – Kitchen Counter Handrails

Step 1: Individual Aging in Place Ideas

Idea 1/ Reason: Aesthetically pleasing handrails at the edge of all kitchen counter tops for steadiness while walking and appliances

Idea 2/ Reason: No threshold - seal tight door - trip hazard reduction

Idea 3/ Reason:

Step 1: Individual Aging in Place Ideas

Idea 1/ Reason: I had no ideas but my engineering husband did! I liked the hand rails idea. Many elderly should use walkers for balance - but don't around the home (have many falls). Having a rail somehow part of the kitchen counters would be a cool idea - Something for elderly to hold onto as they move about the kitchen. Functional and appealing.

Idea 2/ Reason:

Step 2: Group Aging in Place Ideas

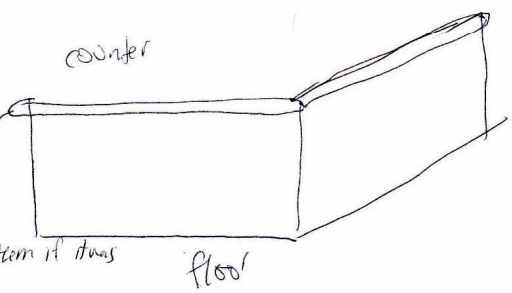
Idea: Trip Hazard avoidance door

Idea: Aesthetic Kitchen hand rails

DTS-4 Illustrate an Educational Prototype

Hand rails - Aesthetically pleasing so they are functional and appealing.

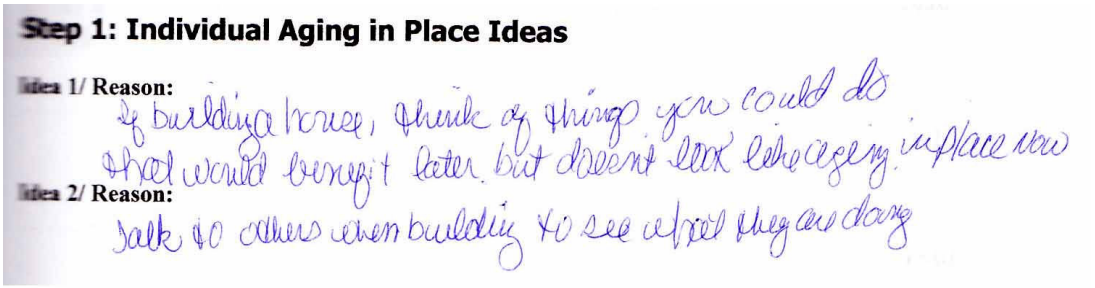
- marketing as a new option when purchasing kitchen counters - when building homes
- Lowes, Home depot - etc.
- facebook -



- this idea would mostlikely be just for the elderly - however many younger folks are caring for their parents so it may be an option for them if it was physically appealing in their home.

Appendix Q: Group 4 Prototype

Group 4 Prototype – Full Scale Mock-Ups



Step 1: Individual Aging in Place Ideas

Idea 1/ Reason: If building a house, think of things you could do that would benefit later but doesn't look like aging in place now

Idea 2/ Reason: Talk to others when building to see what they are doing

Step 1: Individual Aging in Place Ideas

Idea 1/ Reason: Not all preparation for aging are for disabled people

Idea 2/ Reason: A lot of the ideas are to just make life more comfortable

Idea 3/ Reason: Some simply application make big differences

Step 2: Group Aging in Place Ideas

Idea: Any improvements or updates We make to our home, at this age, should include thought as to it, how affects our life in advanced age

Idea: If you are looking at buying or atleast moving consider same as 1st idea

Idea: Heightened sinks & toilets

Idea: Flat entrances & transitions

Idea: Security, fire, s & carbon monoxide ystem

Idea: Full Scale models

DTS-4 Illustrate an Educational Prototype

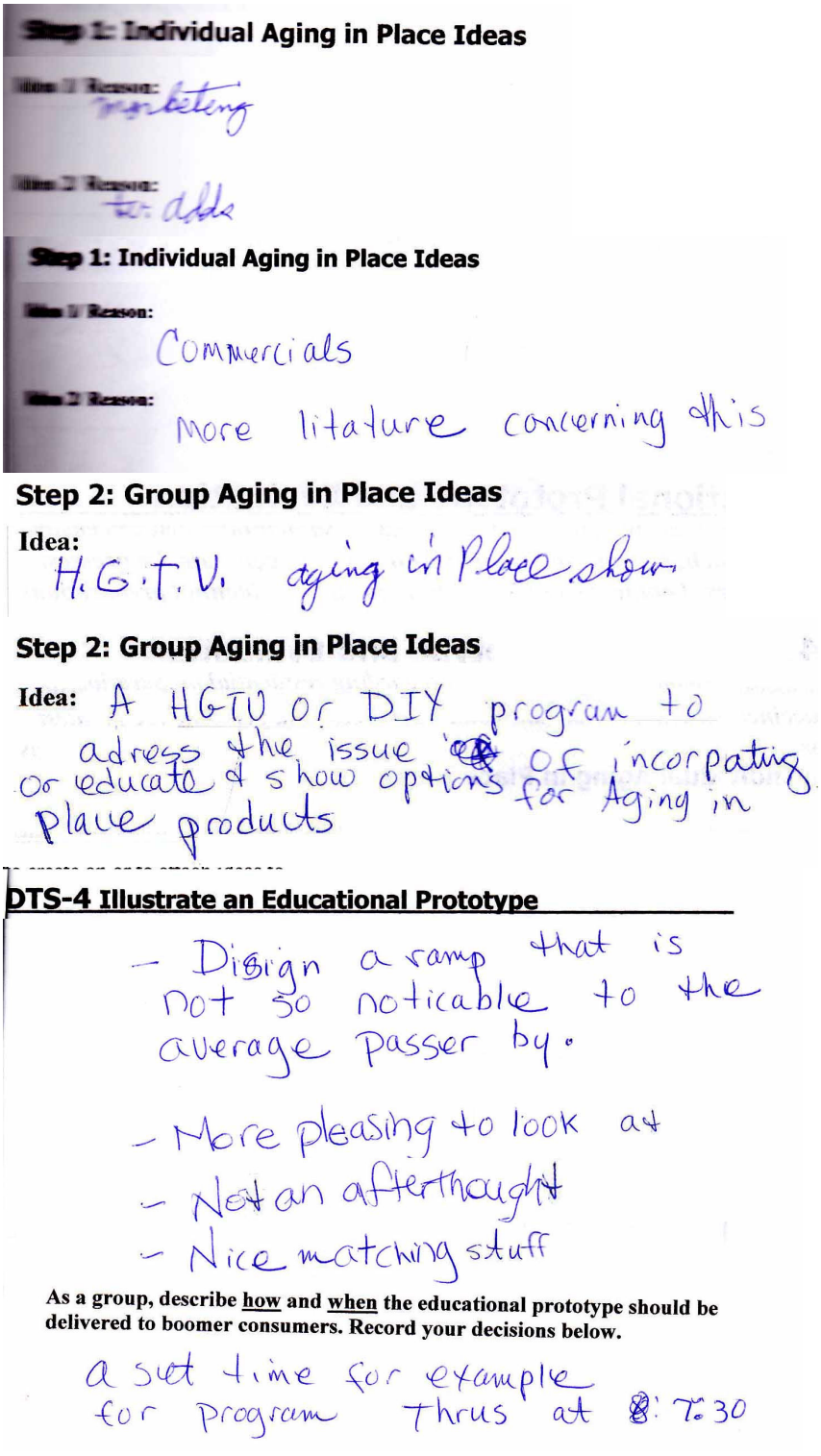
In a home improvement Store you could use such stuff as a home model (cutaway) showing you all the safety features or, aging effiaent ideas sold at this store, such as fire, smoke, heat, carbon monoxide, security etc.

You could also use such model to show other ideas that were not based so much on safety as comfort.

A model home or trailer lot could use a full scale model with aging features

Appendix R: Group 5 Prototype

Group 5 Prototype – AIP Home Improvement Show



Step 1: Individual Aging in Place Ideas

Reason: marketing

Reason: to: adds

Step 1: Individual Aging in Place Ideas

Reason: Commercials

Reason: More litature concerning this

Step 2: Group Aging in Place Ideas

Idea: H.G.T.V. aging in Place show

Step 2: Group Aging in Place Ideas

Idea: A HGTV or DIY program to adress the issue of incorpating or educate & show options for Aging in Place products

DTS-4 Illustrate an Educational Prototype

- Disign a ramp that is not so noticable to the average passer by.
- More pleasing to look at
- Not an afterthought
- Nice matching stuff

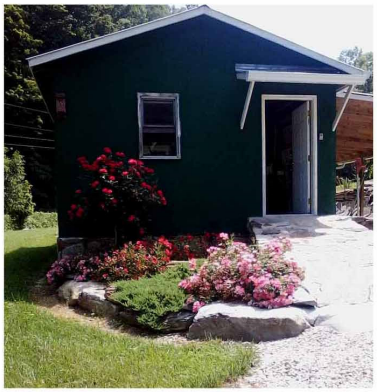
As a group, describe how and when the educational prototype should be delivered to boomer consumers. Record your decisions below.

a set time for example for program Thrus at 8: 7:30

H.G.T.V. Aging in Place show

Noticable ramp examples

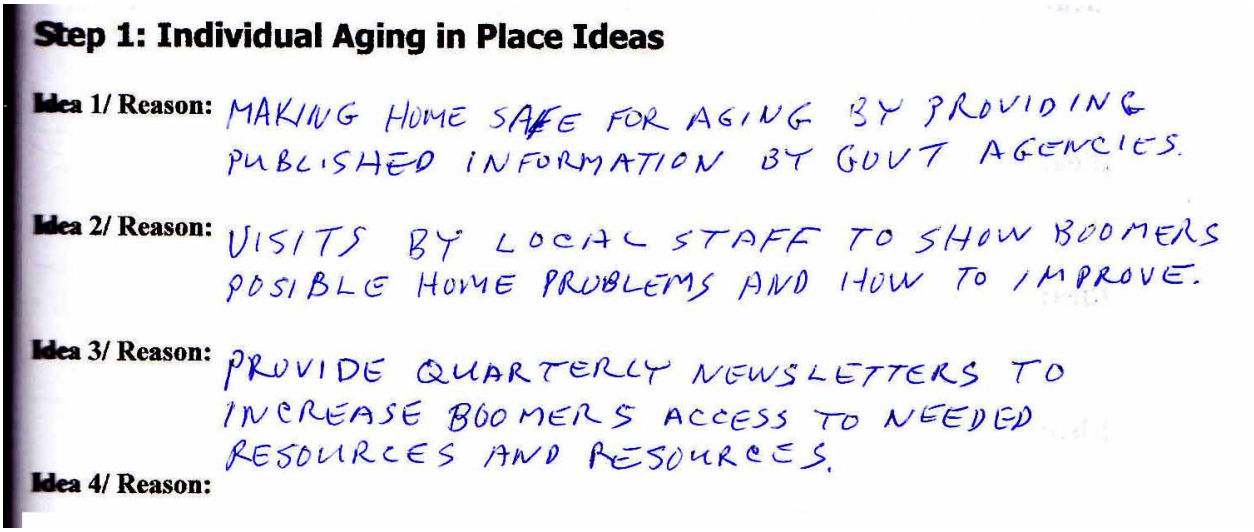
Nice ramp examples



Istall

Appendix S: Group 6 Prototype

Group 6 Prototype – Quarterly Mailed Newsletter



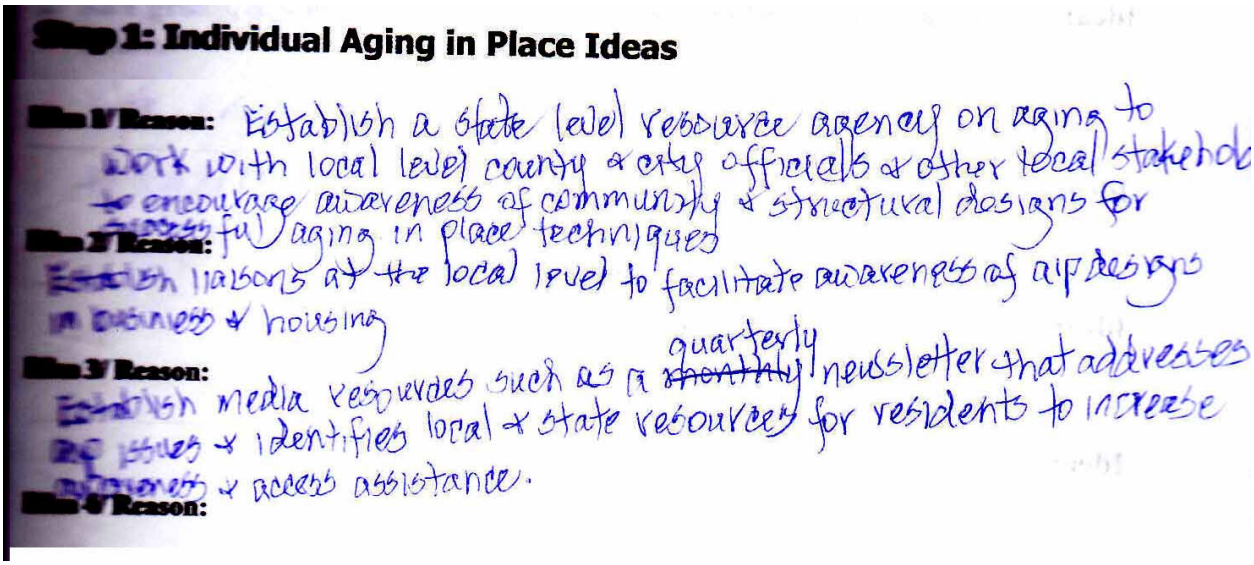
Step 1: Individual Aging in Place Ideas

Idea 1/ Reason: MAKING HOME SAFE FOR AGING BY PROVIDING PUBLISHED INFORMATION BY GOVT AGENCIES.

Idea 2/ Reason: VISITS BY LOCAL STAFF TO SHOW BOOMERS POSIBLE HOME PROBLEMS AND HOW TO IMPROVE.

Idea 3/ Reason: PROVIDE QUARTERLY NEWSLETTERS TO INCREASE BOOMERS ACCESS TO NEEDED RESOURCES AND RESOURCES.

Idea 4/ Reason:



Step 1: Individual Aging in Place Ideas

Establish a state level resource agency on aging to work with local level county & city officials & other local stakeholders to encourage awareness of community & structural designs for successful aging in place techniques

Establish liaisons at the local level to facilitate awareness of AIP designs in business & housing

Establish media resources such as a quarterly newsletter that addresses AIP issues & identifies local & state resources for residents to increase awareness & access assistance.

Step 3: Other Decisions for the Educational Prototype

As an individual, list the types of educational prototypes you think would best benefit boomers?

NEWSLETTERS AND VISITS BY LOCAL STAFF TO IDENTIFY POTENTIAL PROBLEMS AND SOLUTIONS. AND ASSISTANCE AVAILABLE

Step 3: Other Decisions for the Educational Prototype

As an individual, list the types of educational prototypes you think would best benefit boomers?

Free qtrly. newsletter sent to aging households to discuss aip issues & identify potential solutions & local resources for assistance. Also develop video ad showing the concept of AIP & the benefits to seniors.

As a group, discuss your individual prototype ideas, select one, and list it below.

~~Also~~ see above.

As a group, describe <u>how</u> and <u>when</u> the educational prototype should be delivered to boomer consumers. Record your decisions below.

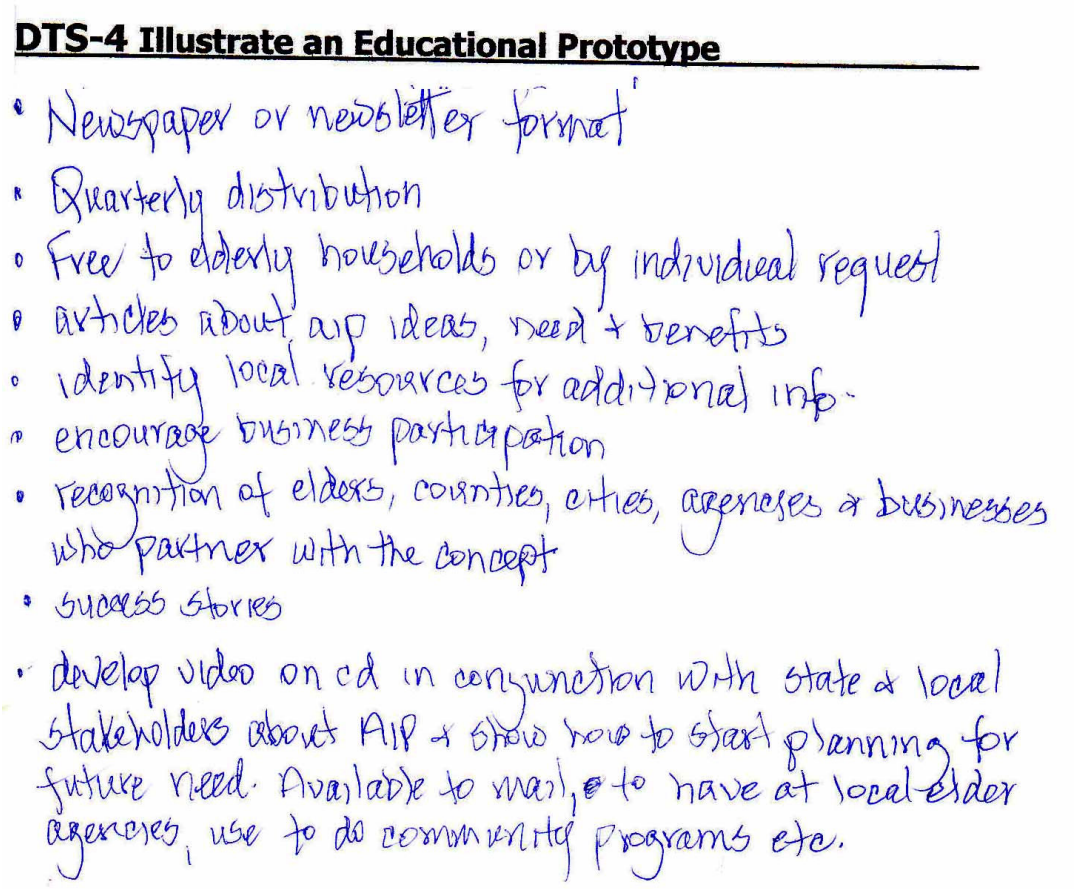
~~Also~~ on demand ~~or~~ to anyone interested. Newsletter free to households 55+

DTS-4 Illustrate an Educational Prototype

LARGE PRINT NEWSLETTERS SHOWING HOW OTHER BOOMERS SOLVED OR IMPROVED THEIR HOMES FOR CONTINUED LIVING IN A SAFE MANNER, AND COSTS FOR CHANGES.

USE LOCAL LIBRARIES TO DISTRIBUTE VIDEOS ON CD'S TO CONSTITUENT GROUPS

ALSO USE LOCAL ELDER ~~AGENCIES~~ NETWORKS FOR DISTRIBUTION.



Group 6 created a newsletter article containing things highlighted and that they had learned from installation manual for their therapeutic tub. The article contained important points they learned from their experience and items of importance from the installation manual.

Considering a Therapeutic tub? This is what you should know.

Use:

- Supervision is also required when an elderly or handicapped individual uses whirlpool bath
- Do not operate this unit without the guard over the suction fitting. The guard is a safety device that reduces the potential hazard of hair or body entrapment. Keep hair and body away from suction guard when pump is running.
- The use of drugs or alcoholic beverages before or during whirlpool use may lead to unconsciousness with the possibility of drowning.
- Persons with a medical history of heart disease, low or high blood pressure, circulatory system problems or diabetes should consult a physician before using a whirlpool.
- Persons using medication should consult a physician before using a whirlpool since medication may induce drowsiness while other medication may affect heart rate, blood pressure and circulation

- Use time should be limited to approximately 30 minutes, followed by a shower to cool down.
- Do not use door as support while entering or exiting the hydro massage bathtub, as door may swing with applied weight.
- Do not add any liquids or powders to the water, especially foamy, bubbly or oily types
- Do not use hydro massage bathtub after strenuous exercise.

Installation:

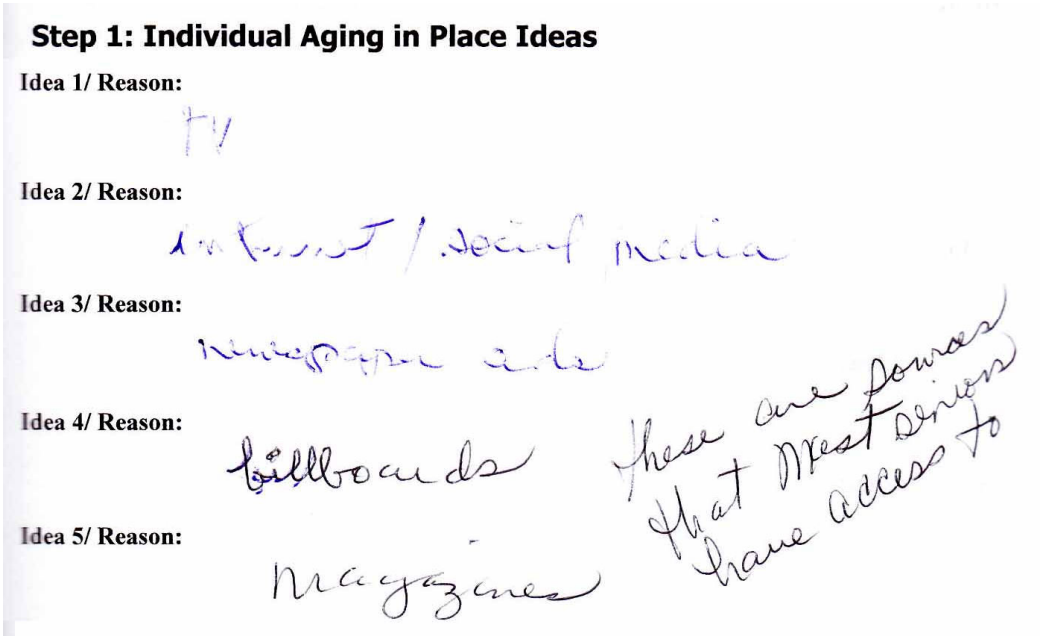
- Standard tub drains are 1 1/2 inches in diameter. Therapeutic tubs require a larger than normal drain. Recommended size is 3".
- This unit must be connected to a circuit that is protected by a Ground Fault Circuit Interrupter (GFCI)

Maintenance

- After each use, rinse all exposed surfaces with warm water, then wipe tub completely dry.
- To preserve the tub finish, waxing is recommended, use of a quality marine wax will maintain the tub finish
- Once a month, purge and clean the entire system using liquid automatic dish detergent,

Appendix T: Group 7 Prototype

Group 7 Prototype – AIP Publication



Step 1: Individual Aging in Place Ideas

Idea 1/ Reason:

TV

Idea 2/ Reason:

internet / social media

Idea 3/ Reason:

newspaper ads

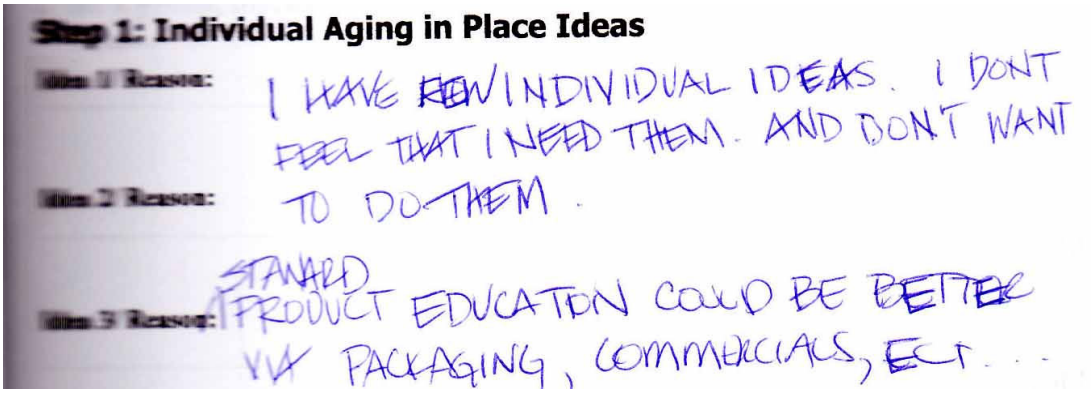
Idea 4/ Reason:

billboards

Idea 5/ Reason:

magazines

these are powers that most seniors have access to



Step 1: Individual Aging in Place Ideas

Idea 1 Reason: I HAVE ~~NEW~~ INDIVIDUAL IDEAS. I DONT ~~FEEL~~ THAT I NEED THEM. AND DON'T WANT

Idea 2 Reason: TO DO ~~THEM~~.

Idea 3 Reason: ~~STANDARD~~ PRODUCT EDUCATION COULD BE ~~BETTER~~ VIA PACKAGING, COMMERCIALS, ~~ECT~~...

Step 2: Group Aging in Place Ideas

Idea: Residential home industry needs to ~~please~~ home upgrades for boomers

Idea:

Step 2: Group Aging in Place Ideas

Idea: WHATEVER SHE SAID.

DTS-4 Illustrate an Educational Prototype

2X's yearly
Home ~~Depot~~ or Lowes —
to list ageing in Place
ideas in a more attractive
and understandable manner
U.D.G. as well.

1) Ramps
2) low maint. landscaping
3) lighting / ext. + int.
4) Walkways
5) flooring
6) Cabinet shelves / pull outs / appliances
7) more sq. footage in bathroom
8) walk in Showers


Ageing in Place Appliances
AIP REFRIGERATORS
Requirements Here
AIP RANGES
Requirements Here
AIP DISHWASHER

Refrigerators