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Crisis 2030: Aging at Risk

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by

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ABSTRACT
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This thesis analyzes critical issues affecting the older adult population of the United States in the year 2030 and recommends policies needed to remedy them. In the first chapter, the thesis addresses the upcoming aging crisis of the baby boomer population, both in numbers and affordability. The second chapter further describes and analyzes the major problems affecting the baby boomer population. The third chapter examines how technology can provide a universal and friendly design for older adult users. Chapters four through seven illustrate four distinctive case studies of Baby Boomers living in the year 2030. The case studies provide resolutions to the issues presented in chapter two. The eighth chapter recommends an integrated set of policies dealing with technology, health care, and home care, which are emphasized in the case studies. In conclusion, the thesis argues for policy changes that should begin to be crafted today in order to be implemented and to achieve the future scenarios depicted in the case studies.

This thesis is affectionately dedicated to
my husband Jose Garrido.
To my parents Maria and Martin Aguilera,
and my brothers Martin and Salvador.
Lastly, to my nieces whom I hope to inspire:
Valeria, Nathalie and Jhineira.

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LIST OF ABBREVIATIONS

QMC	Quantum Mission Control is a Smart Cities software/data base employed by individual states and subdivided into individual cities to monitor citywide system integration data from multiple agencies, all under a single mission control.
RUM	The Residential Unit Mainframe is the central computer integrated with smart homes. It gathers information through sensors and it analyzes that data together with other data obtained though third party databases to find patterns and trends used for providing comfort to its human inhabitants.
OA Unit	Older Adult Units are specialized home types for people over the age of sixty-five. They are smart homes equipped with computers that gather data and analyze it to provide human comfort. These smart homes have smaller footprint than regular homes and utilize space much more efficiently. The typical rural unit is about 1500 sq. ft., while the typical urban unit is around 900 sq. ft. These units are common in the year 2030 as they have government subsidies, and tax credits for sustainable materials and other tax incentives for developers.
QR code	Quick response code is a type of matrix barcode used to store information and use it to track products, identify items, track time, manage documents, etc.
P.E.R.	Personal robot that can be for companionship or utilitarian.

ACKNOWLEDGMENTS

First and foremost, I wish to express my sincere thank you to Harvey Rabinowitz, chair of my thesis committee, for providing feedback throughout my thesis. I am extremely thankful and indebted to him for his valuable guidance, patience, enthusiasm, and immense knowledge. He has been a great mentor and professor, and I could not have asked for a better supervisor. I am also grateful to Edward JJ Olson, for the continuous encouragement and for sharing his expertise, genuine advice, life stories, and editing assistance. I would also like to thank Jim Piwoni for his motivation and sincere advice. My thanks also go to Dr. Sarah Morgan for bringing up valuable comments and remarks, which significantly improved my thesis. I am also immensely grateful to Pamela Schermer for providing invaluable design advice. I take this opportunity to express my gratitude to all the Architecture Department faculty members for their help and support. Last, but not least, I would like to thank my parents, Martin and Maria, and my family for helping me through my entire life. In particular, I must acknowledge my husband, Jose Garrido, without whose love and encouragement, I would not have finished this thesis.

FOREWORD:

MY JOURNEY

Forward: My Journey

If I were to live to one hundred years old, I could say that I have lived one-quarter of my life. In relative terms, that is not many years and few life experiences. Several colleagues, friends and family members have asked me, why are you focusing on designing housing for the elderly? As they perceived this field to be dull and uninteresting, and they believe I am too young to concentrate on this subject. There is nothing wrong with their curiosity. I welcome their questions as it allows me to discuss the importance of the impending aging crisis.

My response was simple since my parents are part of the Baby Boomer generation. They are going to retire, and they will need my help as they continue aging. The question of their future retirement had been brought up several occasions during family dinners when they were in their 40s. At first, I was not interested as my parents were young, and I thought they were invincible. Then, as I was about to complete my bachelor's degree in architecture, my mother had several of her teeth removed as the jawbone was losing mass. The dramatic event greatly affected my mother. She suddenly realized that she was getting old and would have to use dental implants like those used by older adults. It was like a shock to all of my family members, and we each realized the fragility and inevitability of life. My parent's health was of great concern to me, and because I was trained in architecture, I decided that I needed to become more knowledgeable about aging-related issues.

At the time, I was thinking of applying to an architecture graduate program and anticipated graduation in two years. However, in my first year in graduate school my

fraternal grandmother, who lives with my grandfather in Mexico, became critically ill, and doctors feared the worst. She had fluid in her lungs, which was causing heart and mental issues. My father traveled to Mexico and patiently cared for her while she recovered. He ended up staying more than a month, leaving behind his job and family. I felt proud of my father for doing all that was necessary to bring grandmother back to good health. His actions inspired me to think about my parents and their future needs. I could see myself using my architecture skills to provide appropriate and innovative housing for older adults. Thus, I began to focus my thesis on older adult housing.

Slowly, my thesis evolved into a futuristic project that transcended architecture. The investigation captured me as a person and defined my career. Being informed, writing, crafting innovative ideas, and helping others motivate me. I have had deep feelings to help others, regardless of obtaining rewards. I was not initially certain what to do with an architectural education, but now I am sure of my life's mission. The goal for this thesis is creating awareness to the innovative changes to the field of aging by providing an optimistic and 'enchanted' vision of the future. I hope to inspire others to make this thesis a reality. While technology is a large part of the future depicted in the thesis, an equal focus is on the human aspect. If we are lucky to reach old age, we would want to have the best aging-related health and social services. We also would like, the best aging centered housing and technology to help us cope with major aging issues as they evolve. Thus, I have studied, and now I am using case studies of four different older adults to illustrate the possibility of integrating aging friendly housing and technology to compensate for potential aging-related health issues.

CHAPTER 1: INTRODUCTION

THE BABY BOOMER SHOCKWAVE

Chapter 1: Introduction

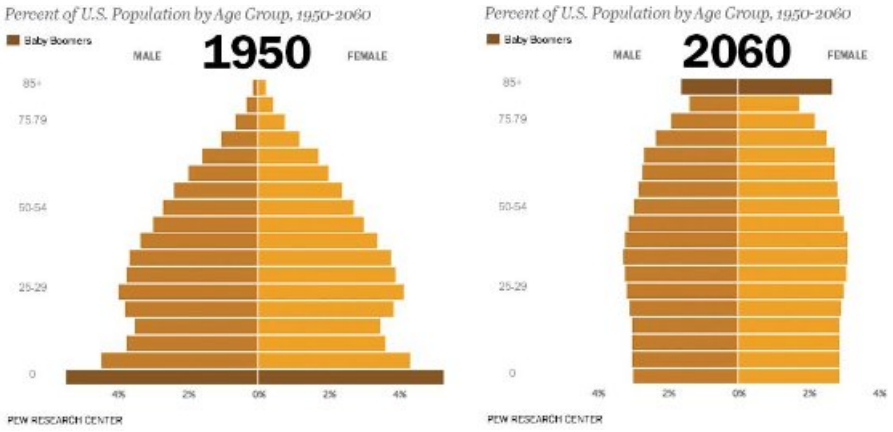
Born under the principles of freedom and progress, some, not all Americans tend to place their faith in technology. From the cotton gin to the electric light bulb to the personal computer, America has provided the world with innumerable innovative technological inventions. Most Americans have an optimistic view regarding technology but are reluctant to change based on their traditional values (Hard and Jamison 92). Nonetheless, Americans, especially the younger generations, imagine a bright future because of the possibilities that technology may offer. This favorable view of technology is a double-edged sword; the favorable views of the future can blindfold a person into forgetting about the impending social issues. One of the major forthcoming issues is the aging of the largest segments of the U.S. population, the Baby Boomers. This thesis will explore optimistic four future scenarios, in which technology will play an integral role in impacting the lives of older adults especially those 68 million boomers, one fifth of our population in the year 2030 (Colby and Ortman 1).

> *"Every eight seconds an American turns sixty-five; that is more than ten thousand people per day, almost 4 million per year" (Poo 3).*

People are born and die every day; this natural cycle has been in place since the beginning of human history. In the United States and other countries, the natural trend when plotting populations by age groups has yielded a pyramid shaped graph. The resulting graph depicts how "large or small cohorts of people born in the same year can be seen to move up the life span and the population pyramid over time" (Merrill 123). In the United States this pyramid shape held true up to the 1950s (United Nations viii). With

a sharp increase in births starting in 1946 and slowing by 1964, the pyramid has been morphing into a rectangle or a block shape (Merrill 123). According to Ray Merrill, the block-shaped pyramid indicates that a population has low birth rates and low death rates, which is indicative of an industrialized country. Starting in 2030, the percentage of Americans 65 and older could surpass the percentage of those younger than 15 years of age (Colby and Ortman 6). Figure 1 shows the change in shape from the percentage of the U.S. population by age group in 1950 and the projected U.S. population projection in 2060.

Figure 1. U.S. Age Groups 1950 and 1960



Source: PCW Research Center, http://www.pwc.com
The population of the United States has been evolving from a pyramidal into a rectangular shape as our population lives longer.

Why is the shift in age structure in the population pyramid important? By 2030, the once nation of the young will become a nation of the old since 1 in 5 Americans, or over 68 million people, will be over the age of 65 (Colby and Ortman 1). The ratio of working to retired will drop from 5:1 to 2:1 by 2050 across North America (United Nations 21). Ray Merrill says, "the ability of a population to support itself economically is of concern to public health and political officials. How dependent certain segments of a

population are on others predicts how well these groups or subgroups can contribute to society" (Merrill 123). The United Nations has described how shifts in aging balance will affect the economic growth, labor markets, taxation, living arrangements, housing demand, and healthcare services (viii).

In the United States, this aging trend will affect the amount of federal resources available to older adults. According to the Medicare Current Beneficiary Survey, MCBS, most people over the age of 65 will need long-term care, as most of them will have at least one chronic illness (Fernald 15). The numbers do not convey the seriousness of the situation, however. The aging trend is alarming as there will not be enough trained professionals to meet the needs of these older adults (Poo 38). Ai-Jen Poo, director of the National Domestic Workers Alliance and writer, also says that the majority of older adults will be unable to pay for similarly indispensable services (38). Thus, it is important to ask how can the U.S. successfully tackle this impending issue, which is delicate, intricate and has many layers of complexity, and prepare a methodology plan to address key issues?

In order to understand the predicament of the shifting populations, it is vital to know general American history. Currently, there are six living generations: (1) G.I. Generation born between 1901 to 1926, (2) Silent born between 1927 to 1945, (3) Baby Boomers born between 1946 to 1964, (4) Generation X born between 1965 to1980, (5) Generation Y/Millennium born between 1981 to 2000, and (6) Generation Z/Boomlets born after 2001 (Howe and Strauss 32). Each of these generations has different outlooks on life, values, attitudes and collective experiences, but as an individual group each has

certain shared characteristics. The oldest persons alive today are part of the G.I. Generation, and by my calculations its youngest members are 88 years old. The second oldest segment of the U.S. population is part of the Silent generation, and its oldest members are 87 years old while the younger members are seventy years old. The aging process has been running relatively smoothly and supporting social services, but there will be a burden on social services to cover the upcoming wave of retiring Americans, the Baby Boomer generation.

The Baby Boomer generation began after the end of World War II, which had resulted in a thriving economy. Landon Y. Jones who coined the phrase Baby Boomer wrote, “By the end of the year [1946], the cry of the baby was heard across the land” (11). Jones also mentions how, “An all-time high of 3.4 million babies had been born in the United States—one every nine seconds—20 percent more than in 1945” (11). According to the U.S. Census Bureau, the baby boomers represent the largest generational group in U.S. history, about 76.5 million in total, which includes people born outside of the U.S (Colby and Ortman 1).

Similarly, the post-war years contributed to the growth of all populations regardless of race, class, ethnicity, and religion (Jones 30). Immigration policies of 1960 also contributed to increases in the birth rate, especially for Mexican and Chinese people in the United States (Jones 30). The growth of aging ethnic minorities will become a major issue in the near future. These international adults are different from their American-born counterparts since many of their cultures dictate that young family members take care of aging parents (Campbell 85). Thus, the type of care and housing

needs may be significantly different within each culture.

As a collective generation, Baby Boomers are self-directed (Howe and Strauss 42). They question authority and are involved in medical decisions. They explore alternative treatments, and they pursue healthy lifestyles. They are also open to non-traditional housing and care (Howe and Strauss 42). They want to maintain independent lifestyle through retirement. Their optimistic views and non-traditional approaches to life make them ideal candidates for new models of retirement. As with previous generations, they want to age in place.

The Baby Boomers honor individualism and freedom established by the founding fathers. Thus, they want live independently for as long as possible. The current pattern suggests that future older adults will remain non-institutionalized until they reach the age of 85, or when their health worsens, and they are unable to be taken care by family members (Fernald 3). According to the U.S. Census Bureau, only 9.2 percent of those reaching the age of 65 occupy nursing homes, but the percentage increases with age and by age of 90 more than 50 percent are in institutionalized care (Colby and Ortman 3).

In 2008, the oldest Baby Boomers, born in 1946, reached the age of retirement. The implications of the aging Baby Boomer generation have begun to influence society's way of life. The Social Security full-benefit retirement age has increased from 65 to 66, and it will gradually rise to 67 for those people born 1960 or later (NASI). The National Academy of Social Insurance (NASI) has concluded that, "the Social Security [program] will raise faster than tax income because the population over age 65 will grow faster than the working-age population." Furthermore, longevity is expected to increase for both men

and women. By 2030, women are expected to live 21.7 years past the age of 65 and men are expected to live 19.5 more years (NASI). In 2031, the youngest members of the baby boomer generation will have reached the new retirement age of 67. The National Academy of Social Insurance also notes that Social Security is not expected to run out. The cuts enacted in the 1980s will just reduce the benefits amount (NASI).

In summary, in the year 2030, the majority of Baby Boomers will be joining the ranks of retired Americans. The social services and health care system will not be prepared to meet their needs. As a group, the Baby Boomers have unique attributes and preferences in housing, healthcare, living arrangement, etc. Thus, new models of housing and health care are needed. This thesis analyzes the issues affecting the older adult and presents the policies needed to remedy them by 2030. This thesis is structured in three parts—part one deals with current aging data, aging issues and technology; part two presents a day in the life of an aging adult in the future; and part three describes the major policies that need to be implemented at the local and federal level in order to address the impending aging crisis. There are four theoretical older adults presented in chapters 4-7, a chapter for each character. These inventive case studies provide a range of diversity of male and female, as well as foreign and traditional Americans, and related life-styles or dilemmas. Their distinctive backgrounds and attitudes mirror the diverse population of future older adults for 2030. Thus, their life stories are used to demonstrate how current issues facing older adults can be solved. Then, chapter 8 goes into detail on the policy changes needed. The next chapter describes and analyzes the major issues affecting the baby boomer population.

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CHAPTER 2: THE AGING CRISIS

ISSUES THAT AFFECT THE ELDERLY

Chapter 2: The Aging Crisis

Baby Boomers continue to change the population dynamics in the United States, and the symptoms of the changes are starting to appear at the macro level. They are dramatically affecting the economy, health care system, Social Security, Medicare, and other areas. The macro issues have been discussed in chapter one, but there are micro level issues that will be analyzed in this chapter. In this thesis, the micro level refers to the human level, those issues affecting individuals. As previously stated, 2030 will see the biggest change in the number of people reaching the future age of retirement, 67 (Colby and Ortman 1). Thus, this year is a logical benchmark for the social and political changes that need to take place in living environments for older adults. The following are issues that can negatively affect the lives of older adults and prevent them from aging peacefully and with dignity. These issues define the problems facing future older adults, and they are exemplified in the case studies in chapters 4-7. In addition, each issue presented provides recommendations for dealing with the individual problems.

Housing Issues

A number of older Americans have to address the issues of deferring retirement because of decreases in retirement savings and losses in household income (Leonesio, Bridges, and Del Bene). As a result, people are postponing retirement, cutting living standards or both (Fernald 12). Ensuring that future older adults have adequate and affordable housing is of utmost importance. Housing that is of good quality and is affordable, defined as consuming less than 30 percent of a family's income enables

individuals and families to afford other services and be more financially stable (HUD). The vast majority of the 50 and older population lives independently within the community, rather than in institutional care facilities (Fernald 19). As Nari Rhee and Diane Oakley describe the magnitude in 1999, "…fewer than one-third of adults over age fifty have started saving for long-term care, one in three employed adults aged fifty-five to sixty-four has no savings for retirement, and another one-third have less than one year's salary in savings" (1). In general, Baby Boomers have lower incomes and homeownership rates than previous generations, and they may be unable to cover the costs long-term care (Fernald 19).

Aging in place is the preferred method of housing for older adults. In its recent survey, the AARP found that, "73 percent strongly agreed that they would like to stay in their current residences as long as possible, while 67 percent strongly agreed that they would like to remain in their communities as long as possible" ("Home and Community" 4). The Centers for Disease Control and Prevention defines aging in place as "the ability to live in one's own home and community safely, independently, and comfortably, regardless of age, income, or ability level" (CDC). An AARP report said that, "successful aging is defined as the ability to maintain three key behaviors or characteristics: low risk of disease and disease-related disability; high mental and physical function; and active engagement with life" (Kochera and Guterbock 4).

Jana Lynott, Senior Strategic Policy Advisor for AARP Public Policy Institute, has said the following about older adults' desire to age in place and the barriers they face:

> In the next 20 years, the number of adult age 65 and older will nearly double in the United States. Many of these people will reject high-priced institutional care and, instead, will continue to live in the community, even if they have one or more disabilities. The degree to which they can participate in community life will be determined, in part, by how well their physical environment accommodates them and the level of services provided. (Farber et al. v)

A recent report by AARP and the Harvard Joint Center for Housing Studies concluded that, "the existing housing stock is unprepared to meet the escalating need for affordable, accessible, socially connected, and supportive services" (Fernald 1). Affordability is important as, "High housing costs force millions of low-income older adults to sacrifice spending on other necessities including food, undermining their health and welfare" (14). As physical and cognitive issues increase with age, older adults tend to live in housing that lacks accessibility features, such as single-floor living, wide halls and doorways, and lever-style doors (4). Homeowners might have to make significant modifications to make the housing accessible. This is not the case with newer housing as they are universally designed (ADA). It is important that older adults remain socially connected to their family members and community. Unfortunately, "The majority of older adults live in low-density suburban and rural areas where it is difficult to shop, access services, or visit family and friends without using a car" (Fernald 5). As a 2010 AARP report said, "about one-fifth of respondents [aged 50 and over] they frequently or occasionally do miss activities that they would like to do because they had limited their driving limitations" ("Transportation" 12). Thus, it is imperative that housing for older

adults, especially those with chronic conditions and disabilities, have adequate supports and services.

There are numerous terms used to describe retirement housing for older adults, and the following are the major categories (Figure 2). The six retirement facility types considered for senior housing include elderly housing, senior/community centers, residential care facilities, nursing homes, and continuing care retirement communities (Goodman 45). Other models of retirement facilities have developed that incorporate some mixture of housing, convenience services, or home care. Detailed information about the housing types available for older adults is included in Appendix A. According to Raymond J. Goodman, Professor Emeritus of Hospitality Management and author, the spectrum of facilities designed for older adults is dynamic and will continue to change as the market redefines its needs (45). He concluded that, "…facilities that previously focused on caregiving and lower-level needs will be replaced in the near future by facilities designed to satisfy the higher-level needs of self-actualization, wisdom, and experience" (47). Goodman's ideas are implemented in the case studies for the future older adults, Linda, Juan, Nancy, and Akina.

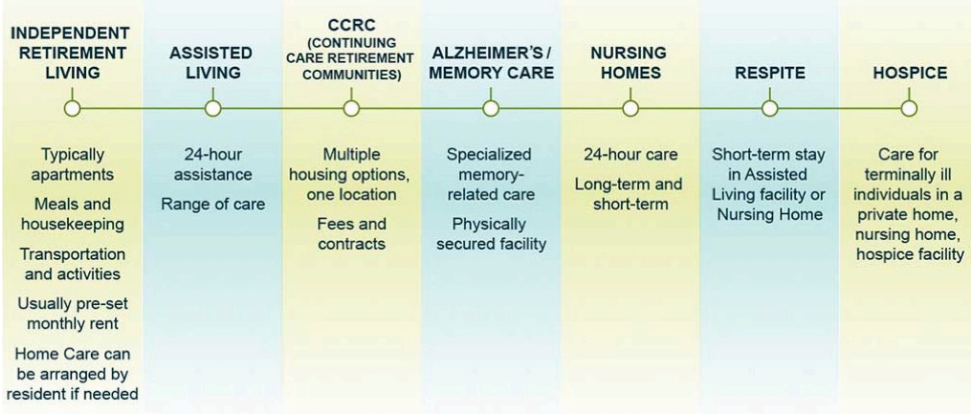
On the other hand, nursing facilities, usually for those aged 85 or older, are not ideal, as the majority of older residents die within two years of being institutionalized (Sidell 58). In some instances, the nursing facilities are located away from communities and other social services (Poo 31). The isolation of the facility can affect the older adults' psychological health as they are away from their families and communities. The best alternative is to help older adults age in place.

As Ai-Jen Poo best describes the problems with some facilities:

> Not only is institutionalization undignified and unhealthy for our elders…it is also enormously costly. In 2010, a private room in a nursing home cost $83,585 per year…and the average stay was 29.3 months. Strike the private room, and the fee for a standard stay in a shared room in a nursing home is still $50,000…per year…Taxpayers bear much of the cost: two-third of all nursing home stays are paid by Medicaid and other government programs, with Medicaid's contribution to nursing homes costs coming to $49.8 billion in 2010…With 11.5 million elders aged eighty-five or older by the year 2035, the cost of institutionalization are unthinkable and literally unaffordable. (Poo 31-32)

In general, the skilled care side of continuum care is dysfunctional. The models and composition of the specialized facilities are out of date (Stewart 73-85). The newer models are moving towards the household model of 10 units, which has open socialization areas and related support systems (Olson). This new model allows older adults to feel a greater sense of home. The model is also cost efficient, as the staffing moves along a back corridor between two units, so staffing is maximized for 20 residents. This model also fosters a sense of community, which is crucial for the aging residents. In addition, each facility is integrated into a community in order to allow residents access to social networks and religious or other institutions, and to prevent social isolation (Fernald 24). As the Harvard Joint Center for Housing Studies concluded, "…older adults' independence and engagement depend upon the communities where they live" (24).

Figure 2 Spectrum of Housing Types Available for Older Adults



Source: Holiday Retirement, http://www.holidaytouch.com
Housing types available for older adults arranged in order of independence to dependence, from left to right.

Aging Disabilities Issues

Although people are living longer, there are many issues afflicting older adults. The U.S. Department of Health and Human Services, HHS, estimates that about 70 percent of people age 65 and older will need some form of long-term care (HHS). The Medicare Current Beneficiary Survey, MCBS, says that of Medicare beneficiaries living in a nursing facility, 74 percent have reported living with two or more chronic conditions, such as heart disease, hypertension, diabetes, arthritis, osteoporosis, pulmonary disease, stroke, Alzheimer's, Parkinson's, and cancers (MCBS) (Figure 3).

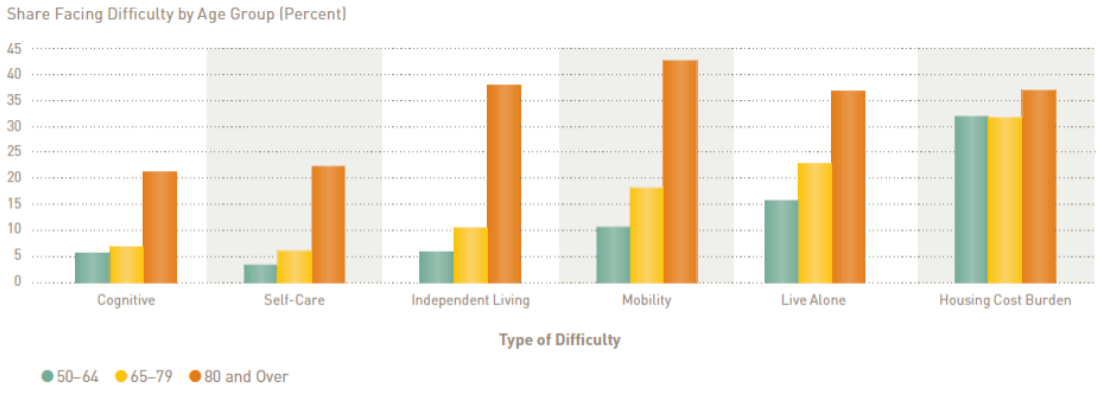
According to Ai-Jen Poo the causes of health concern for older adults are:

> Cancer is still the cause of death for about 20 percent of older Americans, and organ failure for a further 25 percent, but if you make it to age seventy-five having survived both those threats, the likelihood is that you will make it to eight-five…or beyond one hundred. And it's especially in those later years…that people need support…They need support and care—personalized, relievable, affordable care.

> Particularly in the need of support is the growing population with Alzheimer's disease, currently estimated at 4.5 million Americans and expected to be four times as large by 2050. (Poo 25-26)

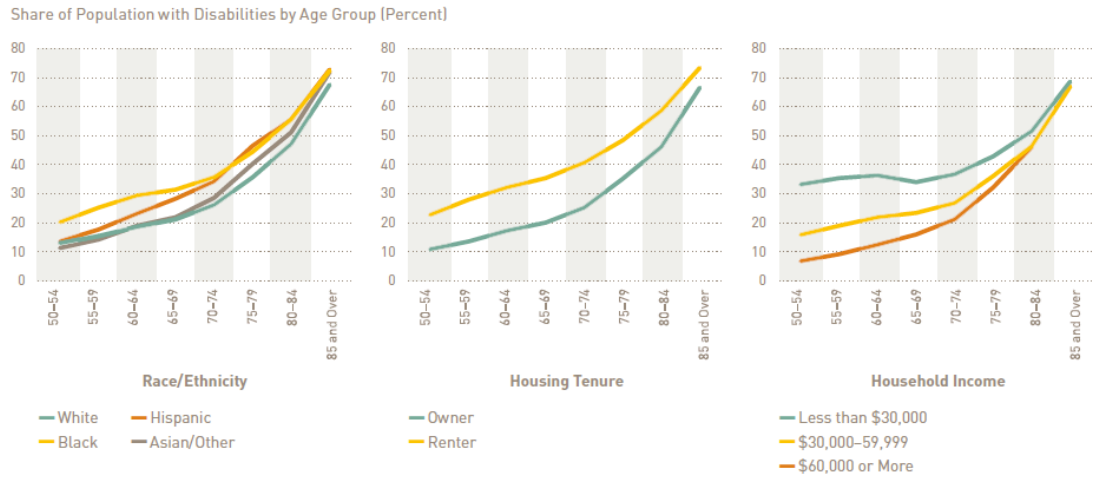
A recent article in *Time* described a timeline when body parts begin to falter, from age 18 to 70. For instance, lung function begins to drop 1 percent every year after 30; heart disease tends to begin around 65; and after 70 the brain starts to suffer age-related changes (Oaklander 80-81). This article described the inevitable aging process that all humans could live through. According to the report by AARP and the Harvard Joint Center for Housing Studies, "By age 85, however, more than two-thirds of individuals have some type of disability no matter what their race/ethnicity, income, or housing tenure" (3) (Figure 4). Older adults have issues with hearing, vision, cognition, or mobility (Fernald 11). Out of all the age related issues afflicting older adults, reduced mobility, such as problems walking or climbing stairs, directly affected their ability to live independently and capacity for self-care.

Figure 3 Aging Increasing Risks of Disability, Isolation, and Financial Stress



Source: JCHS tabulations of U.S. Census Bureau, 2012 American Community Survey.
Graphs show the great increase of disability, isolation and financial stress after 80 years of age.

Figure 4 Disabilities Affect Most People in Their 80s Regardless of Race/Ethnicity, Tenure, and Income.



Source: JCHS tabulations of U.S. Census Bureau, 2012 American Community Survey.
The three graphs depict a sharp increase in disability after 80.

The following examples are some of the physical changes that afflict older adults, and each provides recommendations to provide appropriate living environments. The following description of the health related issues and recommendations are taken from Raymond J. Goodman, Jr., PH.D, and Douglas G. Smith's book *Retirement Facilities: Planning, Design, and Marketing.* First, farsightedness is a progressive dysfunction caused by the lens of the eye growing inflexible (Goodman 11). The ability to adjust from light to dark contrasts is slower as people age, and this can cause disorientation and dizziness (17). To help elderly having sight problems, three variables to keep in mind when planning a space are reflection, absorption, and diffusion. Lighting in senior environments should be of medium brightness, except in task-specific areas.

Second, most of the older adults lose their ability to perceive the depth, quality, and subtleties of sound (25). In order to help people suffering from hearing problems, acoustics must be designed to minimize background noise. Third, aging can reduce sensitivity to both hot and cold. Reaction time is also slower, and water-heating systems need to be calibrated to prevent scalding (29). Fourth, many elder adults suffer from

memory and mental impairment as they age (30). The only mental impairment that can be directly attributed to age is the loss of short-term memory. There is a greater decline in the speed of response and ability to integrate what is observed than there is in verbal ability or memory (30). The design of the signage and their placement will be of the utmost importance to the design of a space.

Lastly, many older adults lose strength and dexterity as a result of conditions such as arthritis (39). Thus, the living space should incorporate door handles and faucet handles that require minimal effort, such as European-style door handles, which are better than doorknobs or handles. The purpose of designing living spaces for older adults is to maintain their functional independence, but the spaces should not feel as they are for an impaired or handicapped population (40).

Financial Issues

Future older adults will have a tougher time affording retirement. As they have fewer savings, are living longer, and the cost of living is rising (Poo 33). Also, their population numbers will stress government supports. Typically, household incomes peak when people "…are in their late 40s and then begin to fall as the share of individuals able or needing to work declines. The drop in incomes accelerates in the 60s and continues thereafter" (Fernald 12). The decline in income might force some retired adults to re-enter the workforce and work longer in their lives. Unfortunately, these older adults might encounter ageist stereotypes or have trouble finding a job due to their disabilities or limited skills (12).

Most adults work during early years to save for retirement and to be financially independent. However, Ai-Jen Poo describes how retirement is becoming a luxury:

> Today there are many stories of elders who simply cannot get by on a monthly $1,230 ($14,760 per year) Social Security check, which the AARP confirms is the main source of income for almost two-thirds of older American households and the sole source of income for one-third. Meanwhile, a home health aide costs approximately $21 per hour, paying for an assisted living facility averages $3,300 per month, and a semiprivate room in a nursing home costs $6,200 per month.
>
> According to the U.S. Census Bureau, 3.5 million seniors now live in poverty, and when health costs are factored in, the number living in poverty increases to 6.5 million. In fact, retirement is increasingly becoming a luxury. Since 1977, there has been a 172 percent increase in employment after age seventy-five. The rising costs of food and heating combined with the expense of medication and doctor's visits are requiring that everyone scrimp and save. Health costs are rising, too, and many elders are skipping doctor's visits or medications because they are too expensive. (Poo 33-34).

Even with decent savings, the federal Department of Health and Human Services emphasizes that:

> With 70 percent of us needing long-term care services…after turning 65, and the limited coverage of public programs, there is a good chance you

> will have to pay for some or all of their services out of your personal income and savings. Even if you only need a little assistance at home with personal care, paying for long-term care out of your personal income and savings can be difficult. ("Cost of Care")

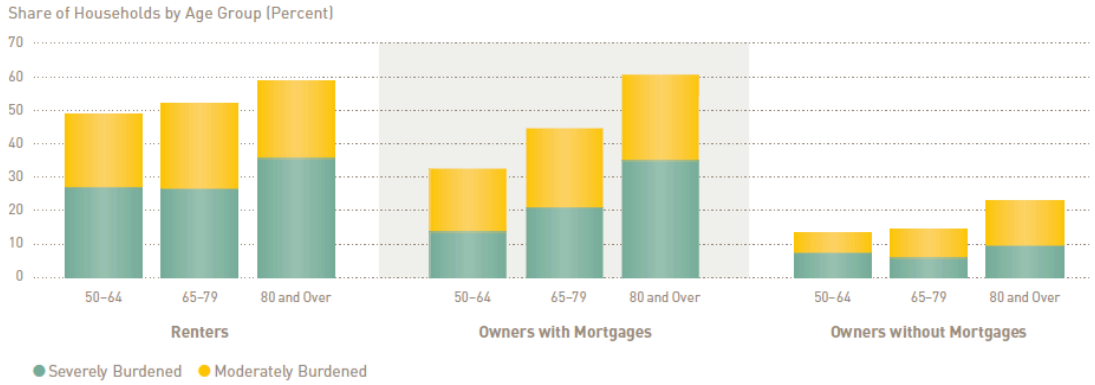
In addition, all types of debt held by this age group have risen, but the biggest problem is mortgages (Fernald 3). As the report by AARP and the Harvard Joint Center for Housing Studies says, "More than 70 percent of homeowners aged 50-64 were still paying off their mortgages in 2010", and about 20 percent of them had secondary mortgages, such as home equity lines (15). The primary source of wealth for older adults is home equity (Poo 34). John Pottow, in a paper published by the Consumer Bankruptcy Project, found that bankruptcy filings by seniors age 65 to 74 rose by 178 percent during the period 1991 to 2007, which was before the housing crash of 2008 (Pottow 221).

Despite the recession and decrease in home equity, older adults that were homeowners were financially better off than renters. The typical homeowner, in 2013, earned over $40,000 more than the average renter (Fernald 13). Thus, renters will have higher cost burdens, which will affect their ability to pay for other necessities (14) (Figure 5). In addition, "The typical homeowner…has enough wealth to cover nursing home costs for 42 months…[while] the median older renter, in contrast, cannot afford even one month in a nursing home" (4). Regardless of household incomes, most older adults, by their 80s, face financial pressures (3). Although incomes decrease for all households, minority members who had fewer work opportunities have less homeownership (Figure 6). Thus, minority baby boomers will be disproportionately

represented among those in need of government help through the last phase of their lives (Fernald 8).

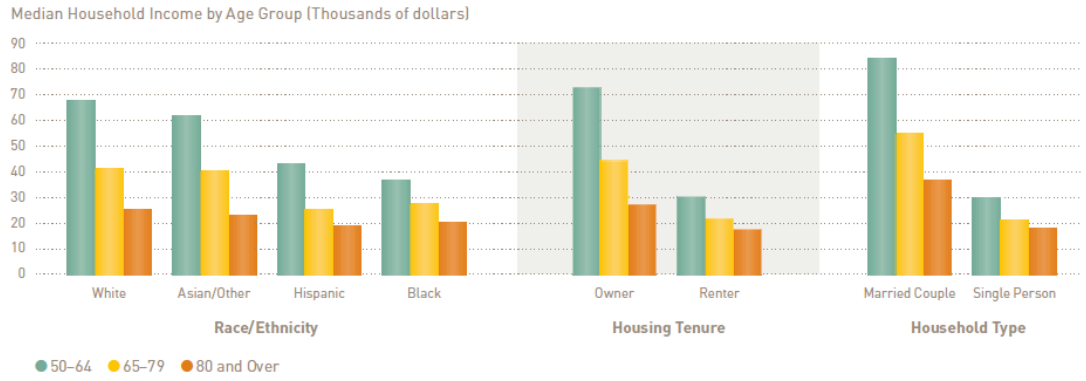
In order to help reduce the living cost burden on future older adults, government programs must be centralized. According to Ai-Jee Poo, "Currently America has in place a patchwork of government programs that attempt to provide assistance with income, housing, food, health care, and personal care…[but] the programs are confusing and expensive…while [they are] important in the short term…[they] are ultimately outdated and inefficient" (36). This solution will be explored in detail in chapter 8, which deals with policy.

Figure 5 Households Owning Their Homes Outright Are Much Less Likely to Be Cost Burdened



Source: JCHS tabulations of U.S. Census Bureau, 2012 American Community Survey.

Figure 6 Incomes for All Households Types Drop with Age, Reducing Disparities Across Groups



Source: JCHS tabulations of U.S. Census Bureau, 2012 American Community Survey.

Health Care and Home Care Issues

Today, health care and home care programs face challenges, and it will only intensify with the number of Baby Boomers that will need these services. Currently, there is a shortage of registered nurses and geriatricians in the United States (Poo 37). The shortage of geriatricians is accounted for by the monetary compensation, which is the lowest paid specialty in medicine and by the aging of the workforce itself (38). According to an IOM report, low Medicare reimbursement was the biggest barrier for the number of physicians specializing in geriatrics (IOM 18).

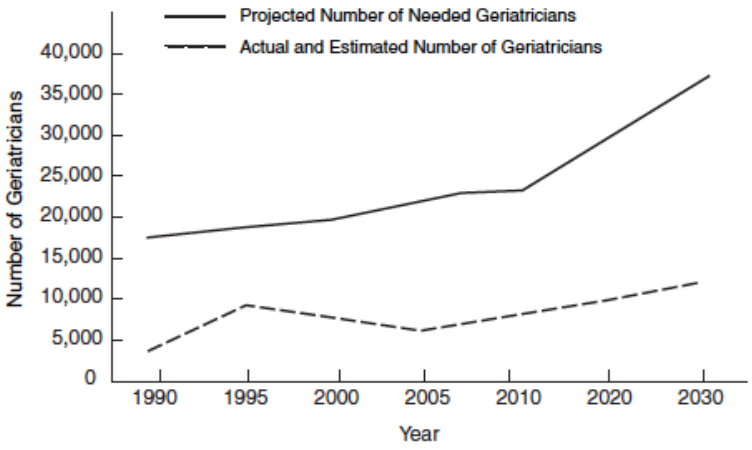
As Ai-Jen Poo best describes the disadvantages of treating older adults:

> Medicare reimbursements are modeled on standard procedures: a consultation that takes forty-five minutes is reimbursed at the same rate as a seven-minute visit. But examining an elder takes a long time: just getting undress and positioned for an exam requires significant effort…and getting succinct answers to questions posed to the elder can be challenging, especially when the person has dementia or memory problems. When the doctor's visit end, the results may not be conclusive, or may not lead to the kinds of procedures that our medical system privileges—those involving expensive technologies or specialists. (Poo 38)

In addition, only 3 of the top 145 American medical schools have a full geriatric department, and less than 3 percent take a course in geriatrics ("Medical" 8). According to the Geriatric Society, there are about 9,000 M.D. Geriatricians and around 2,400

geriatric psychiatrists (AGS). A geriatric psychiatrist or geropsychiatrists is professionally trained to meet the mental needs and syndromes that affect the elderly ("Geriatric Psychiatrist"). In 2013, the ratio of geriatricians to older adults was 1: 870, but an adequate ratio should be 1:300 (Brittain). Also, the Alliance for Aging Research recommends that 20,000 geriatricians are needed to take adequately care of the older adults in the U.S ("Medical" 9). The Institute of Medicine estimates that by 2030, about 36,000 geriatricians will be required (IOM 19) (Figure 7). At the current rate, the number will not meet the needed geriatricians; a solution to this problem is further discussed in chapter 8.

Figure 7 Projected Numbers of Needed Geriatricians



Source: Alliance for Aging Research, 2002.
The U.S. does not have proper amount of geriatricians and it will not be prepared to meet the number of needed with the wave of retiring Baby Boomers.

Similarly, another challenge of the U.S. health care system is the limited geriatric training provided for the workforce. Several health-related studies show that older patients' health improved when the providers were trained in geriatrics (Kovner et al. 78-

89). As nurses trained in geriatrics are less likely to be physically restrained (Evans et al. 675-681). The training of the nurse translates to patients having fewer readmissions to the hospital, and having less incorrect transfers from nursing facilities to the hospital (Naylor et al. 613-620). In a health care system already critically short of primary care providers and geriatric specialists, many of these older patients will likely end up in emergency rooms. As a recent article by Jonathan Rauch, journalist for *The Atlantic* and *National Journal,* said, "…when something goes wrong, the standard response is to call 911 or go to the emergency room. That leads to a revolving door of hospitalizations, each of them alarmingly expensive. More than a quarter of Medicare's budget is spent on people in their last year of life, and much of that spending is attributable to hospitalization" (Rauch). This inappropriate use of Medicare funds is adding to the already high-cost devoted to older adults.

Also, Ai-Jen describes the problem with the U.S. health care system that focuses on delaying death, rather than on quality of life:

> Too often medical care for people near the end of life focuses on costly, high-tech lifesaving procedures when what is actually needed is comfort and management of ongoing conditions—also known as palliative care. At the state where a loved one cannot be "cured" in a hospital but is not ready to die, palliative care is the only path, yet Medicare usually doesn't pay for it; instead, many elders experience regular, repeat visits to the emergency room, costing billions. It's the hospital stays like these that eat up 70 percent of Medicare's budget. (Poo 39)

Furthermore, few percentages of health care providers identified themselves as specializing in geriatrics: about 4 percent of social workers and 1 percent physician assistants ("AAPA" 6-7). In general, there is little training in caring for older adults, and their training varies depending on the program (IOM 22). There are no federal requirements for those who care for the elderly, only limited requirements for the direct-care workers, such as aides and certified nurse assistants. However, Joanne Lynn, geriatrician and health service researcher, describes the consequences of untrained physicians,"…illnesses in older people are misdiagnosed, overlooked or dismissed as the normal process of aging, simply because health care professionals are not trained to recognized how diseases and drugs affect older patients differently than younger patients" (Lynn 11).

Lastly, by 2030 there will be a shortage of caregivers, as the family caregivers cannot meet all the needs of the future older adults (Poo 71). As older adults want to age in place and stay home for a long as possible, they will eventually need professional caregivers. According to Ai-Jen Poo, there are about 2 million caregivers in the U.S. (82). Caregivers have a variety of titles and work settings, their jobs vary from being nutritionists, drivers, personal organizers, or teachers, and they provide physical and emotional comfort (83,84). According to the Bureau of Labor Statistic, these people fall into three categories: certified nursing associate, home health aide, and personal care assistant (Bureau of Labor). The certified nurse and home aide require a state license to practice as they involve medical responsibilities (85). The employers are typically families of older adults, and they pay the caregiver or agency. However, the working condition combined with low wages and long hours has led to a high turnover in the

industry (89). Also, professional caregivers face, "…high rates of depression from isolation, separation from their families, stress, and fatigue" (91). Those workers who left a home care job tended to find a job in a different industry (92). Caregivers are important to elder adults and also to health care, as they potentially cut healthcare costs by managing chronic illnesses instead of sending older adults to expensive institutions.

In summary, with the increasing numbers of Baby Boomers entering the age of retirement, the United States is not prepare to meet their housing requirements, specialized medical needs, and specialized home care needs. Currently, there is a lack of accessible and affordable housing. There is also a shortage of physicians specialize in elder care, and professionals who can take care of the aging population. The systems in place are inefficient and outdated, and they will not be able to manage the incoming wave of older adults. However, these critical issues will set up the tone for the case studies and policy chapter. Methods to tackle these issues are provided in chapters 4-8. The next chapter will deal with the humanization of the interface between humans and technology, as technology will play a major role in the year 2030.

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CHAPTER 3: HUMANIZATION OF TECHNOLOGY

CLOSING THE GAP

Chapter 3: Humanization of Technology

As I transform my thoughts into written and cohesive sentences, I am realizing the amount of technology surrounding me in my small studio apartment. I am writing on a desktop computer, which has a wireless mouse and keyboard. My smartphone and tablet are connected to my desktop. The computer is streaming music, which in turn uses wireless Internet, provided through the router and modem. Adjacent to the router is my personal cloud storage device, which in turn uploads pictures from my professional camera. The small kitchen has a refrigerator, stove, microwave, coffee maker, blender, and toaster. The bathroom, there is a hair dryer, hair straightener, and a mechanical toothbrush. And I am also wearing a white analog watch. Just counting from memory, there are over twenty devices. They blend so seamlessly with my life that I forget they are continuously working.

Those are just some of the devices or appliances that most Americans use in their everyday lives, but often forget about the intricate mechanics required to make them work. Designing devices that are respectful of humanity and fulfill human drives are essential for the future (Rose 7). Given that this thesis presents case studies based in the year 2030, it assumes that technology will be a major factor in the everyday lives of older adults. It is imperative that future technology is user-friendly and universal, especially for older adults who have specialized needs. This chapter provides a method to offer a humane interface between technology and human users by "enchanting" the objects. As Arthur C. Clark said, "Any sufficiently advanced technology is indistinguishable from magic"(Clark 21).

When technological devices become integral to a human life, they become imperceptible. Users tend to notice the importance of these devices when they break. A study conducted by *Current Biology* concluded that humans use tools as an extension of the body (Baccarini et al. 492). The study found that the body incorporates the device into the body schema. Meaning, people do not have to think about the tool as they use it, the body does unconsciously. For instance, when a person drives a car, all the controls like the steering wheel become an extension of the body. The body knows when to break for a red light when to use the signal, etc. It is only when the tool stops working that people stop and think about the function of the tool. Thus, when the steering wheel of the car suddenly vibrates, the user immediately becomes aware of the car. At that moment, his or her mind changes from automatic to conscious thoughts as he or she tries to figure out the cause of the problem (492).

The fact that most people do not to perceive the complex mechanisms in everyday life makes the tools seem magical. As users do not have to think consciously about how the device works, as they work independently. Successful tools that enchant users are the ones that become essential to human life.

When David Rose, an award-winning entrepreneur, author and instructor at MIT Media Lab, described the objects as being enchanted he said:

> I'm not talking about deceptive magic—tricks and sleight of hand…is about how to strategically design and develop products that are engaging and essential, that resonate an emotional connection with us human beings. I have spent nearly twenty years developing Internet-connected

> things, and remain disappointed that so few products succeed in enchanting us. Instead, they are difficult to understand, frustrating to use, overwrought with features. They diminish rather than empower us. (Rose xi)

In the book, *Enchanted Objects,* by David Rose analyzes the four future worlds trajectories. The four worlds are Terminal World, Prosthetics, Animism, and Enchanted Objects (Rose 11-12). In general terms, a Terminal World is one where the glass slab and painted pixels have taken over. The Prosthetics World is where humans become superhuman with the help of prosthesis. An Animism World is populated by swarms of social robots. Out of all these trajectories, the Enchanted World, where ordinary objects are made extraordinary, is the best choice (Rose 15). In the Enchanted Objects World, the objects fulfill six basic human drives and provide value by creating objects found in fantasies and folklore (Rose 47). This thesis will utilize the Enchanted Objects World trajectory, also called Internet of Things, in the case studies.

The technological devices used by the theoretical older adults in the case studies might seem unfamiliar, but like any other invention, after time they become ordinary. Take the evolution of the phone for example. When Alexander G. Bell first introduced the phone in 1876, the device was composed of heavy parts, which transmitted the spoken work to a receiver (Zigterman). These early machines were leased in pairs and required subscribers to set up their telephone line (Bellis). By 1878, making calls with these phones vastly improved with the invention of the Strowger Switch, which could connect one line to any of the 100 lines (Bellis). In this system, the users had to call the

operator, who manually connected the two phone lines. The design of the phone was improved several times until the touch-tone system was developed in 1941, which resulted in the invention of the cordless phone (Bellis). Then, in 1947, the development of small cells base stations produced the first cellular, portable device (Bellis). From its humble begins the telephone has been inserting itself into the lives of humans. Today, it is rare to see a person without a personal phone. This communication machine, which took so long to evolve, has become ordinary.

Since, the technologies discussed in this thesis are specialized for older adults, the devices have to start as ordinary, but then become augmented and enhanced to provide specialized services (Rose 47). The devices and appliances in the case studies are universal and can be used by younger generations, but they were designed for this particular target market. The specific issues that affect older adults are eyesight, mobility, strength, muscle mass, touch, smell, and hearing. For detailed age-related issues see chapter 2. Older adults prefer to live independently, but as they continue to age and become less mobile, they will become isolated. Eyesight impairment and slower reflexes will result in a reduction of driving time or suspension of driving privileges. Social visits will diminish as their friends also start to drive less or pass on. Family members, if they have any, will visit them periodically but for most of the time they will be alone. Social isolation, mobility problems, and other age-related problems can be relieved with the help of technology, but the technology must be user-friendly, safe, and affordable.

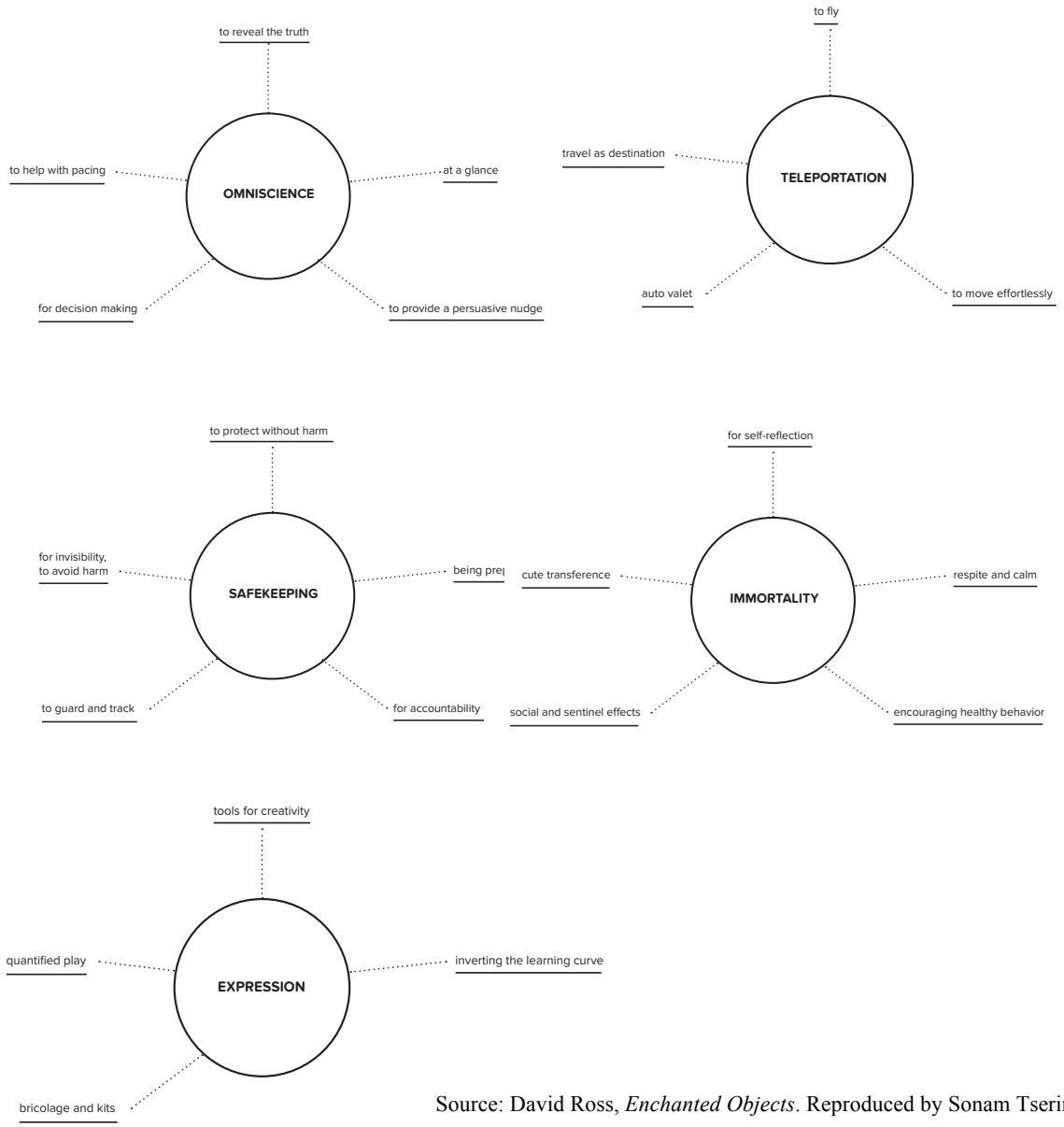
In order to make indispensable user-friendly technological devices, one of the six basic human drives—omniscience, telepathy, safekeeping, immortality, teleportation, and

expression— must be met (Rose 64) (Figure 8). Omniscience is the human desire to have vast knowledge (66). Telepathy is the desire to communicate with others with ease, transparency, and through thoughts (66). Safekeeping is the fundamental human desire to be protected from harm and feel safe anywhere (66). Immortality is the desire to live longer, healthy, and fully capable (66). Teleportation is desire to be transported easily and joyfully from point A to point B (66). Lastly, expression is the desire to express the self through many forms and types of media, such as acting, art, writing, cooking, dancing, and self-documentation (66). Rose found that these human behaviors are at work when certain products enamor consumers.

Once the device idea or prototype satisfies a human drive, it needs to be designed for enchantment (Rose 157). All devices have unique qualities that human users prefer. As Rose said, "Enchantment arises from the set of unique qualities…I see seven 'abilities' that differentiate enchanted objects from smartphones and their apps…The most important: glanceability, gestureability, affordability, wearability, indestructibility, usability, and loveability" (Rose 173). These abilities relate to how users learn from the devices and conversely, to engender trust, and to act as respectful agents of time and attention of users (173). Glanceability means that the product gives just the amount of information required making the best choice without unneeded detail (173). Gestureability is the inherent qualities of devices in which users instantly know how to interact with them (181). They are familiar objects, which are augmented, and users know how to use them. Affordability refers to the capability of adding computing mechanisms to ordinary objects, as the price of computing has dropped dramatically (182). Wearability is the ability to embed small sensors into the wardrobe (185).

Indestructibility means that devices are made from materials that are almost impervious to damage and last for decades (188). Usability is the ability of an object to work on behalf of users with a minimal interface (189). Lastly, loveability is the emotional connection that inanimate objects create with humans by bestowing human attributes to the devices such as big eyes, big heads, or short noses.

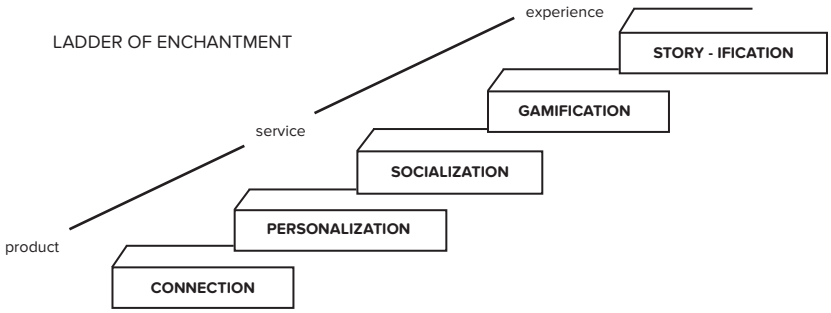
Figure 8 Human Drives



Source: David Ross, *Enchanted Objects*. Reproduced by Sonam Tsering.

The last process of enchanting an object, from theory to practice, is to follow the five steps on the Ladder of Enchantment (Rose 193) (Figure 9). These steps will help an object develop the seven abilities of enchantment discussed above. The first step is to add sensing/sensor capabilities by connecting to the cloud. An Internet connection allows the transmission of sensing and signaling information, the processing and storage of information, and the delivery of new services (195). The second step is to personalize the device by adding and leveraging the user's personal information (198). By collecting large number of data about people's behavior it will tailor to their unique services. The third step is to make it sociable by adding connections to friends, loved ones, and colleagues (200). The connection may be between person and thing or between thing and thing, sometimes with a person as a go-between. The fourth step is to add the fun and motivational elements of video games (201). Once an object is connected, personalized, and socialized, the next step is to enchant its users by getting them in the game. The final and fifth step is to add a human narrative for the product, service, or user, called story-ification (203). By climbing the Ladder of Enchantment, designers can create unique and functional objects that can engage with users.

Figure 9 Ladder of Enchantment



Climbing the ladder of enchantment bestows more personality, more product differentiation, and the ability to charge a premium with each step.

Source: David Ross. *Enchanted Objects*. Reproduced by Sonam Tsering.

Nonetheless, when utilizing technology to solve human issues, it is important to use human dynamics. In the presidential address for the Society for the History of Technology in 1985, Dr. Melvin Kranzberg said, “technology is neither good nor bad; nor is it neutral” (Kranzberg 544-560). This statement would later become Kranzberg’s First Law. Dr. Kranzberg was alluding that technology cannot be understood as an independent concept since it is part of the complex relationships that individuals create with each other and the world (Hansen). As such, technology can have different effects depending on the unique circumstances that are used to subjugate it (Hansen). Recently, the Future of Life Institute signed an open letter calling for increased attention to maximizing the social benefits of developing artificial intelligence (FLI). According to FLI website, their mission is “to support research and create initiatives for safeguarding life and developing optimistic visions of the future” (FLI).

As technology exponentially develops and continues to take an active role in human activities, it is important to focus primarily on the interface between technology and people (Rose vii). No technology can replace human-to-human interaction, as humans are social by nature and want to be surrounded by other people. With aging comes social isolation (Fernald 24). Technology can lessen social isolation by providing other modes of communication, transportation, and companionship. Nevertheless, technology will never be able to provide the warm, pulsating, and feeling of the human touch. For this major reason, technology should take the passenger seat and allow the primary modes of interaction to be between human and human.

Lastly, it is important to discuss the use and ramification of Big Data in this thesis. Big data is the use of large pools of data that is analyzed by sophisticated algorithms, and the resulting patterns can allow individuals and companies make better decisions (McGuire et al.). Big data refers to the process that one can do on a large scale that cannot be done at a smaller scale (Mayer-Schönberger and Cukier 6). The use of big data is the new information revolution affecting many areas of industry and the global economy (McGuire et al.).

As Vicktor Mayer-Schönberger and Kenneth Cukier explained this phenomenon:

> The fruits of the information society are easy to see, with a cellphone in every pocket, a computer in every backpack, and big information technology systems in back offices everywhere. But less noticeable is the information itself. Half a century after computers entered mainstream society, the data has begun to accumulate to the point where something new and special is taking place. Not only is the world awash with more information than ever before, but that information is growing faster. The change of scale has led to a change of state. The quantitative change has led to a qualitative one. The sciences like astronomy and genomics, which first experienced the explosion in the 2000s, coined the term "big data." The concept is now migrating to all areas of human endeavor. (Mayer-Schönberger and Cukier 6)

The main advantage of using Big Data is the value it creates for individuals, companies, and governments. The use of Big Data in this thesis is necessary for the

health, comfort, and finances of older adults. As governmental agencies and third party companies that utilize large pools of data will provide most of their services. There are five ways that Big Data can be leverage to create value for an organization or company (McGuire et al.).

First, Big Data creates value by making information transparent. Making information available can provide a source of efficiency, as there are data on paper that is inaccessible and unsearchable. Second, by collecting and storing more data companies can boost performance and provide critical information to clients. Having digital records of transactions, inventories, etc. can help companies make better management decisions. Third, Big Data analyzes customer information, and can help companies tailor products and services for a specific target market. Fourth, Big Data can be put through sophisticated analytics, and the results can provide accurate information to improve decision-making or minimize risk. Fifth, companies and users can use Big Data to develop innovative services and products with data obtained from sensors embedded in existing products. However, there are disadvantages to Big Data, such as loss of privacy and anonymity. Also, punishing people based on their propensities, and predicting human behavior that might take away their free will (Schönberger and Cukier 170). But, the advantages for the use of Big Data, if monitored correctly can outweigh the disadvantages.

In this thesis, the primary value of Big Data will come in the form of health care providers who will be able to help more effectively older adults age in place. As McGuire explains:

> MGI estimates that if U.S. healthcare fully used all the available techniques that can be enabled by Big Data, such as analyzing records of real-world medical treatments, their costs and health outcomes to guide physicians on which treatments provide the best outcomes at the best cost, the annual productivity of the sector could grow by an additional 0.7 per cent…Sets of data such as patient records and clinical claims would have to be integrated.
>
> Doing so would create benefits not just for the various industry players but for patients [clients], who would have broader, clearer access to a wider variety of healthcare information, making them more informed. Patients would be able to compare not only the prices of drugs, treatments, and physicians, but also their relative effectiveness, enabling them to choose more effective, better-targeted medicines, potentially even customized to their personal genetic and molecular make-up. (McGuire et al.)

In summary, with the upcoming aging of the Baby Boomer population technology will play a significant role in providing solutions in daily living and health services for older adults. There is an ambivalence and fear of technology in the pre-boomer age cohorts. But, the Baby Boomers have come to embrace technology as they grew up with technology; they were in their 30s when Apple launch its first computer (Rogers 3). Whereas older generations reaching the age of sixty could not readily adapt newer technology, Baby Boomers are expected to be the exception (Rogers 1). Thus, technology

can provide solutions to aging-related issues, dysfunction of the continuum of care, and health service. However, technology without the human element is not a solution. The technological devices need to be humanized and become user-friendlier, as explained by David Rose. Technology and aging is of primary concern for this thesis. The solutions to bring down its technological costs are discussed in chapter 8. The following chapters illustrate the lives of four older adults living in the future who maximize their lives through the utilization of human focused technology.

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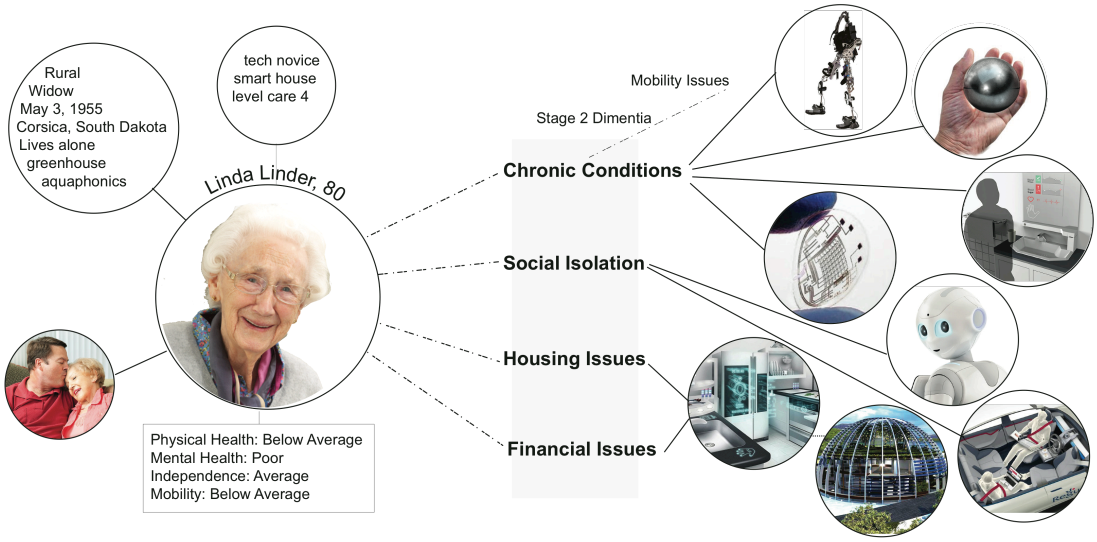
CHAPTER 4: LINDA

A RURAL TALE OF INNOVATION

Chapter 4: Linda



Source: Guadalupe Aguilera Corona ©
See Appendix C for older adult tech comparisons and sources.

The first case study of the hypothetical older adults living in the year 2030 is a woman who was born and raised in rural South Dakota. She is humble, honest, hard working, independent, and religious. Her life in the country has been simple and modest, but she has been through tough times as well. Ultimately, her strong convictions and faith in a Supreme Being have allowed her to face her fears and resume life. This positive outlook on life has contributed to her adoption and immersion in technology. Due to her family farm and right financial decisions, she can afford better housing options and higher quality services. Unfortunately, she suffers stage 2 dementia, and her therapies have only slowed down the progression of the disease. The Tri-Net has been a blessing for her family as she can receive best care and services while living alone at home. This case study exemplifies how policy changes and technology can help older adults with chronic disease age in place. The following is a story from a typical day in her life in the year 2030.

As the sun begins to bathe the pre-matured aged timber walls of the smart house, sensors embedded within the foam-core frame send electronic signals to the residential unit, RUM. RUM is the smart house's computer or brain, which has been running since it came alive in 2020 A.D. It has never shut down, as its memory is stored in the cloud. RUM is programmed with human behavior logarithms and follows Isaac Asimov's Three Laws of Robotics.[1] RUM's main purpose is to provide optimal human comfort and safety of its residents, in this case, Linda J. Linder. She lives in this rural smart home specialized for older adults, an OA Unit (Appendix D).

A year ago, Linda had started self-recording for the American Family Ancestors project. The following are recordings accessed from her online profile on one of the familial ancestry websites:

> My name is Linda J. Linder, previously called Linda J. Bailey. I was born on May 3, 1955 in Corsica, South Dakota. Born and raised in Corsica, I never had any other place to call home. I lived at my parent's farm for fourteen years until I married James D. Linder," says the self-recording video of a smiling, white and shorthaired lady named Linda. She is taking part in the American Family Ancestors project for one of the online familial ancestry websites.

[1] The brain of the smart house, RUM, follows Isaac Asimov's Three Laws of Robotics—a robot may not injure a human being or, through inaction, allow a human being to come to harm; a robot must obey orders given it by human beings except where such orders would conflict with the First Law; and a robot must protect its own existence as long as such protection does not conflict with the First or Second Law. Last modified May 1, 2015, http://www.auburn.edu/~vestmon/robotics.html.

It's 5:24 in the morning on June 15, 2030 A.D., and the Corsica Quantum Mission Control, QMC, has calculated that it will be a sunny day with 15 mph winds due north.[2] The citywide system has been in constant motion gathering data through cameras, sensors, and GPS devices. Sophisticated algorithms to identify patterns and trends have analyzed the data. The information is being displayed on a huge 5k monitor, which is then divided into smaller sections that show the city's systems information. Computers analyze and store the information, but a small group of people monitors the information and actively makes decisions on the course of action. Even with all the data that is being fed to the system, the employee's humanity is palpable in this mission control. The Corsica QMC is supplying information to individual smart homes that are connected to the cloud. This cloud is secured and monitored by a governmental agency to protect against illegal access. The smart house only receives raw data from this source as well as raw data from other third party databases. The constant access to raw data allows the smart house to run functionally and optimally.

In Linda's smart house, all appliances or devices are wirelessly connected and programmed by RUM. The data in each device is encrypted and can only be accessed and modified with the owner's biometrics, in this case Linda J. Linder and her son James Linder Jr.

Linda's self-recording says the following about her life and family:

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[2] IBM built the first Smarter Cities concept to Rio de Jadeiro in 2010. The Operation Center of the City of Rio gathers data from over thirty agencies. This system collects data by cameras, sensors and GPS devices and uses computer power to analyze the data and put it through algorithms to identify patterns and trends. Last modified May 1, 2015, http://www.nytimes.com/2012/03/04/business/ibm-takes-smarter-cities-concept-to-rio-de-Jadeiro.html?pagewanted=all&_r=0.

"We were a happy couple in every sense of the word. We moved to a modest two-bedroom home near James' family farm. James had been working on the family farm as soon as he could walk. James's duty and responsibility were to take over the family's trade and properties, as he was the oldest son. He continued to be groomed into the farmer's way of life until the death of his parents when he inherited everything." She takes a pause trying to recall as country music from the 70s plays in the background.

"James and I were blessed with four children, three daughters, and one son. You could say that our marriage was equal as we each had about equal responsibilities with all the farm duties and constant house upkeeps. The children grew up helping around the farm just like we had grown up. The three girls, Susan, Mary, and Lisa, got married and moved out before the age of twenty." As she says this, there is an apparent change in her mood. She shifts her weight and continues.

"Susan was the only one that stayed in Corsica. James Jr. enlisted in the army at the age of eighteen and was sent off to Panama to overthrow the Panamanian dictator. That happened sometime in the 80s. After his active duty, James Jr. moved back to Corsica to the family farm, and he married his high school sweetheart but divorced her years later," Linda says with a disillusioned tone, as her religious upbringing does not approve of divorces.

Less than a second after the sensors detected a significant amount of photons, RUM initiates the Saturday Morning Mode, which Linda programmed. Having lived on the farm from birth, Linda likes to wake up with the sunrise. Several wireless signals have been dispersed from the central computer to the appliances. The coffee machine has turned on, as Linda enjoys the smell of freshly brewed black decaffeinated coffee in the morning.

RUM has sent a signal to the mechanical window shades to retreat and the purple flower pattern fabric curtains to open. As Linda's closed eyes detect light, she begins to wake up. Sensors embedded within the bed detect irregular body movements, and it sends a signal to RUM. The computer analyzes the data and compares against Linda's previous sleeping patterns, and determines that Linda is waking up. RUM sends a signal, and the speakers embedded in the ceiling through the house begin to play her favorite songs. It was proven by a social worker, Dan Cohen, in 2008 that listening to songs with significant emotional connections to a person suffering from dementia helped them recall those events and improved their memories and mental health.[3]

Linda slowly opens her eyes, which have almost-clear sight after her fully functional prosthetic eye surgery. On this particular morning, "I Will Always Love You" by Dolly Parton is playing through the embedded roof speakers. She feels happy remembering when she and James married and this song played as they danced.

[3] Dan Cohen first implemented a program in nursing facilities in 2008 to make access to personalized music to elders. He put 200 iPods in four facilities and obtained great results, which are shown in a documentary called *Alive Inside*. Basically, by playing the right playlist patients various forms of dementia can help them recall certain memories. The degenerative disease does not affect these memories, as they are store or encoded differently in the brain. Cohen has a national organization, Music & Memory, which help long-term care facilities by providing personalized music to the residents. Last modified May 1, 2015, https://musicandmemory.org.

Linda's online profile provides more information about her marriage and family:

> "James Sr. and I proudly watched our children and grandchildren grow up on the family farm. We stayed married for fifty-one years, until death do us part. James had a heart attack and died. He was buried in a plot adjacent to his parent's graves." She finishes speaking quickly to stop the small tear dwelling inside the eye from coming out.

Although Linda lives alone in a small unit, about 900 square feet, she does not feel lonely because she has her personal robot, P.E.R. She sits up and reclines on the bed headboard and P.E.R., which had been asleep in the corner of the room, wakes up and rolls over to Linda's bedside. P.E.R. uses its robotic plastic arms, which have a texture similar to a hard gel, and Linda uses them for support. Linda has a walking disability, and following her geriatrician's recommendation, she ordered a bionic exoskeleton. The exoskeleton is due to arrive today. Medicare and local nonprofits mostly covered the cost of the device, and the rest she had to pay. At 75 years of age, Linda is expected to live at least fifteen more years, a ten percent increase from 2015.[4] She plans to live in her smart home until life comes full circle.

P.E.R. initiates a friendly conversation with Linda asking her about her feelings, moods, and overall health issues. The companionship robot reads news or feeds from Linda's family members. Linda's children also have personal robots, which pair with each other and relay information about their respective owners. Today, P.E.R. delivers

[4] The life expectancy for 2015 is taken from the U.S. Census Bureau, 2011. The prediction for Linda's life expectancy is based on my own assumption of future medicine. Last modified May 1, 2015, http://www.census.gov/prod/2011pubs/acs-17.pdf.

news about Susan, Linda's older child, and her recent promotion. P.E.R. reads out loud the comments from Susan's family, friends and co-workers, and a brief news article from her company's newsletter. Linda is happy to hear the great news, but she is having trouble remembering who Susan is. [5] P.E.R., analyzing her hesitation, reminds Linda that Susan is her daughter. The robot starts to play, "I was Country When Country Wasn't Cool," by Barbara Mandrell, which helps Linda remember her daughter. This episode is engraved in her memory forever. Linda clearly remembers when Susan was dancing and singing this song in the living room while she thought that nobody was watching.

In the kitchen, Linda goes to pick up her medication from the dispensing machine, which has a blinking blue light. The medicine dispenser is no bigger than standard letter size. It is embedded in a niche on the kitchen wall. The dispenser is clear with three light sensors and a retina camera in the upper middle part of the frame. The camera scans the eyes, thus preventing unauthorized access to drugs. The eye scanner matches exactly with Linda's eye biometrics and the machine releases the precise dosage of pills. The medicine dispenser is controlled wirelessly by her doctor's office, which automatically keeps track of the type and quantity of drugs. The dispenser can be taken out and transformed into a carrying box for trips or to refill at the pharmacy. The security features allow access only to Linda and the approved pharmacy providers. There are many options for purchasing and refilling the medication. For Linda, the smart home takes care of ordering the medicine online automatically. When a particular medicine reaches a low quantity, RUM

[5] Dementia causes nerve cell death by an abnormal protein built up that blocks communication between nerves cells. The death of cells causes the brain to shrink. Thus, a person's capacity to think, plan, and remember diminishes as the disease progresses. Stage 2: CDR-0.2 or Questionable Impairment is a scale that represents slight impairments. The person has minor memory incontinences, challenges solving problems, trouble timing, and disengaging in social activities. However, the afflicted person can still manage his or her own personal care. Last modified May 1, 2015, http://www.healthline.com/health/dementia/stages#Stages4.

automatically sends a refill form to the doctor's office. The doctor's office then approves it, and sends the request to the pharmacy. The process is fast and efficient, within an hour from the time the initial request, the medicine is placed in the mail for next-day delivery. When the medicine is delivered, Linda or James has to place the smart medicine container in the dispenser, which automatically sorts the pills and dissolves the biodegradable container. The smart dispenser produces no waste and diminishes human error.

The medicine-dispensing machine communicates with P.E.R, which makes sure that she takes her dosage every day. P.E.R. aids Linda to sit on her foldable dining table; it's stored in the wall when it's not in use. Her cup of coffee is already on the table served with a side of toast and grapefruit. Linda enjoys her breakfast looking out the window into the farmland beyond. She likes to look outside, retreating into her own world. Her fixed eyesight is noted by P.E.R. and the robot goes into sleep mode, as it is aware that she likes to watch in silence.

Linda's self-recording includes the following about her troubles and triumphs, and how the new housing technologies were introduced to her life:

> "I was sixty-four years old when James Sr. died. After his death, I was devastated and was not sure how I would continue with my life. There was this big space that followed me around. Those were difficult and dark times. Many sleepless nights and days that seemed to drag on for an eternity. I now see it as a test of faith from the Lord. My life had been pleasant before James' death. God had blessed us. But when James

suddenly died, I was lost. Reading the word of God was the only way I could sleep at night. Instead of cursing and blaming the Lord for my misery, I started to count my blessings, as I knew God would restore my life, like the story of Job." Linda says this with glee in her eyes as if trying to convey an important life lesson.

"God and time slowly healed my heart. I kept reading 1 John 4:7-21 over and over again, until I understood the meaning of love. I needed to love everyone as God had loved me even before I was born. To love everyone was my new mission. I reached out to my children, close friends, and church fellows. I let each and everyone know that I loved them. They helped me get my life in balance." She was now smiling like a schoolgirl after having tasted ice cream for the first time.

"Regardless, my children and grandchildren would worry for my health and safety. I was living alone. James Jr. and Nancy, who lived closer, would frequently visit. My deteriorating health was of concern to James, who felt powerless as I began to show signs of dementia. It finally dawned on him that his mom was old-old. He would later tell me that he researched frantically for solutions and my future planning. After reading several news articles and other stories he talked with his sisters, and they decided that I needed to have a smart home," she says with a proud smile.

"I was surprised that my children would suggest that I needed to leave the home they all grew up in. I was hurt. I listened to their concerns and

> decided to get a smart home. The new house would be located on the same plot of land as the family home. However, we needed to do several real estate deals, such as subdivide the land into smaller parcels, in order to obtain the tax benefits. The old home along with several acres were sold to cover the new construction," she said in a monotone voice as she tried to explain in few details.

It's 6:45 A.M. and Linda focuses back on reality. The food is barely touched, but the mug has kept the coffee warm. P.E.R. reminds her to finish her breakfast. Linda eats her toast and coffee, then grabs the grapefruit and finishes it. She has plenty of time to enjoy life as RUM coordinates the house chores. The smart appliances and gadgets complete the tasks. P.E.R. takes the dirty dish and mug to the universal washer.

Today, Linda wants to do light gardening in her small 450 squared-feet greenhouse located on the second floor of her house. To access the greenhouse, Linda must walk on an ADA approved concentric ramp. The ramp allows her to move plants and equipment with ease. Before she can indulge in the pleasures of gardening, Linda will be getting ready for her day. She can dress herself but tends to forget how to get dressed. Dressing up is simple, as the ergonomic design of the clothing requires little movements. The clothing has sensors, and it will vibrate if the item is put on incorrectly. P.E.R. is also there to show her diagrams in case she forgets. Linda does not need to carry personal items, as all her important data is stored in her wearable wrist device. This device has a flexible screen and a powerful microchip that pairs with Linda's OA Unit and autonomous car. With the device, she can turn on/off electro domestics, call and

video chat with contacts, open house doors, program the car, and set up the house alarm. The wrist device can also monitor and record Linda's vital signs, and control other functions by proximity or hand gestures without having to press any buttons.

Linda goes out of her room and walks over to the circular ramp. She goes to see her aquaponic vegetable garden, which provides most of her food.[6] She is growing Romanian lettuce, kale, basil, chives, mint, tomatoes, cucumbers, beans, peas, squash, broccoli, cabbage, cauliflower, and peppers. She also has tilapia, sunfish, and fancy goldfish. A local farmer rents most of her farmland, and she negotiated a contract to receive money plus a small percentage of whatever the farmer is cultivating. In the greenhouse, Linda is growing a rare hybrid of roses. They are just begging to bloom and white, and purple spots are showing on the pink buds. What a joy. After some hours of light labor, she sits down and takes a nap on the bright walls under a shade.

In the online ancestry website, Linda's self-recording mentions how the governmental polices and housing technology helped her:

> "One of the greatest benefits of having a new smart home was that it allowed me to be part of the regional South Dakota Geriatric Tri-Net. As you might know, the function of this federal network is the constant monitoring of one's health. I receive specialized help remotely without having to visit the doctor's office for routine check-ups. The smart house,

[6] An aquaponic garden combines aquaculture (raising fish) and hydroponics (growing plants in water) to raise fish and organic vegetables together. The Aquaphonic systems use 90 percent less water than traditional gardens, and there are no weeds, pests, or fertilizing. The system is a self-contained ecosystem, which requires little human interaction. The fish waste is used as a food source for the plants, and the plant's roots provide a natural filter for the water habitat. Also, worms in the plant's growing bed convert ammonia from the fish waste into nitrates and then to solids, which are then use as food for the plants. Last modified May 1, 2015, http://aquaponicgardening.theaquaponicsource.com/what-is-aquaponic-gardening/.

the geriatric hospital and clinics, and social services connect wirelessly to provide quality health care and services. I apologize for not providing more information on it, as I understand in general terms, but can't provide detailed information." Linda takes a pause to collect and arrange her thoughts.

"I will describe the dry but informative smart housing process as it might help others like myself decide to change houses in the near future. On the day we had to apply for the elder housing benefits, James Jr. sat next to me at the Elder Social Office. The social worker, Mrs. Dolores Dean, a bright lady in her forties provided me with a list of approved general contractors who would be able to help me construct the smart home. Mrs. Dean explained in general terms how the smart home worked along with visual aids. She then gave us an electronic card with a QR code containing a URL link to a video and other useful housing information on the U.S. Social Security website." She paused.

"Along with housing information, Mrs. Dean signed me up for adult day care at the St. Mary's Senior Center. She said the day care would keep me entertained during the day, as I would be able to meet with other older adults and enjoy life. She was right. I also signed up for a seminar on smart housing technology that taught me how to control the new home. I was excited about the new opportunities and was looking forward to the tech classes, which I hoped would help keep me in contact with my

younger grandchildren. My family had already succeeded in getting me used to having a smartphone, e-mail, and social media. Learning how to use my new house was just a new goal," she ends the sentence with a gentle laugh.

"In the following months, James Jr. and I had selected a contractor, a fellow by the name Bob Rockton. Mr. Rockton was the head of a small contracting firm that specializes in smart homes. He was about forty-five years old, chubby, but tall, with messy salt and pepper hair. He had been working in construction for about twenty-five years and recently switched to building smart homes after he realized the considerable economic gain. To receive the government tax incentives, Mr. Rockton took an intensive course and passed a standardized test to obtain his certification. This certification allowed him to work directly with retiring Americans looking to switch to new smart homes or to upgrade existing homes," she said eagerly.

"During our consultation with Mr. Rockton, he agreed that building a new home would be more beneficial to my health and wealth. He provided us with several pre-designed house models, OA Units, available on the Elder Housing Administration website. The house models were free of charge and I could customize each one with my preferences through user-friendly software embedded within the site. With the help from my children and grandchildren, I designed my new home. I kept adding and

taking away a small greenhouse until the day construction began, and then I decided to keep it, bringing the total square footage to 900 square feet." She laughs as she remembered her ordeal.

"When construction began the topsoil was cold from the harsh winter that had passed. That was in March of 2022. A team of three construction workers was at the site through the entire construction phase. The construction technologies used allowed for faster development and less manpower. We decided to use a new material composite for the walls that would be 3D printed on site.[7] The new material would also have a better R-value; I think that is what it was called. The constructor said it was the cutting edge technology for materials. This new material was as strong as steel, and it would last longer if there were ever a fire. Knock on wood. The exterior, let me read my notes, had hydrophobic properties and micro atom structure to keep it clean from dirt and would clean itself with rainwater. The little maintenance was a big incentive for me." She took a brief pause.

"A large pit was dug to install a geothermal system. Also, the systems and appliances used would allow my new house to be carbon-positive, which means that it produces more energy than it consumes. I do not have to worry about energy costs for the rest of my life, and I have been selling

[7] 3D Printing its in early stages of the construction technology. Some innovators have started to research its application in concrete. For instance, Contour Crafting is a construction technology that uses a rapid-prototype to fabricate large concrete components in a layer-by-layer fashion. The process is controlled by a computer, and it uses robot arms and extrusion nozzles to make the components. The advantages of this construction technology include, reduction in energy use and emissions, low-income housing, and superior surface finish. Last modified May 1, 2015, http://www.contourcrafting.org.

this electricity back to power utility company. The money gained pays for my other expenses. My new home also has a rain collecting system and water recycling. I use the stored water for the greenhouse. The greenhouse uses an aquaponic system to grow edible and non-edible plants." Linda smiles, as she loves having the greenhouse.

"Within three months both the greenhouse and the smart house were completed. The electrician and computer system technician came last to install the smart components, devices, and computer mainframe. I moved in within fifteen weeks from the start of construction. It was an exciting and unique experience. I would highly recommend it to others who can make the change as the benefits outweigh the process." She then ends the recording.

It is 11:15 A.M., her vibrating wrist awakens her. She receives a lunch RSVP from Mary Louis. Linda confirms her attendance. She goes back inside her residence to change her attire. The two friends will be getting there by James' autonomous electric car, which is parked in the self-charging station powered by the sun in James' garage. Just before leaving for lunch, Linda conveys tasks to P.E.R., which will be passed on to RUM. Linda programs the autonomous car to pick her up at the front entrance from her wearable wrist device.

As she stands at the front entrance, the door does not unlock automatically. Linda grabs the handle, but it will not open. A light embedded in the door about eye level is blinking, and her wrist is vibrating. A message reads on the door: "Linda, check your

vital signs". She reaches for the right side of the door where a niche in the wall contains the device used to perform her daily blood test and other vital signs. The Smart Health Assistant is a 2.5" diameter metal ball, which can run multiple diagnostics and send the information directly to a particular doctor(s) wirelessly. Linda grabs the ball from the UV case, which has a built-in charging station. She holds and grips the device on her right hand while it quickly draws a nanoliter of blood within nanoseconds.[8] The entire process is painless and efficient. The Smart Health Assistant simultaneously takes her temperature, blood pressure, heart rate, respiratory rate, body mass, and strength. The ball vibrates, and Linda knows it is done; she places the ball back on the stand inside the sterilizing case. The front door automatically unlocks, and Linda walks over to the car.

The autonomous car is waiting outside. It automatically unlocks as Linda approaches it. The car greets her with a personalized message on the dashboard. Linda gets inside of the car and programs the route by pressing a button depicting an icon of a person. She then selects the name of Mary Louise on the dashboard screen. There are ten buttons on the dashboard representing different activities, which change with individual users. Thus, Linda's personalized dashboard includes activities such as senior center, geriatric clinic, geriatric hospital, food mart, shopping, church, park, hair salon, friend & family, and home. Inside the car, is a u-shaped seat facing the front of the car. There is an emergency wheel that can be control in manual mode, but Linda has never used it. The car will self-drive while Linda listens to her favorite songs and enjoys the scenery. Within eight minutes, the car is at Mary Louis' house and a new route is selected for a lunch venue.

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[8] A nanoliter is one billionth of a liter or $1x10^{-9}$ of a liter. Last modified May 1, 2015, http://www.merriam-webster.com/medical/nanoliter.

It’s 11:50 A.M. and Linda and Mary Louis arrive at the mom and pop family restaurant called Joe’s Fine Diner. Madison, the restaurant’s hostess, warmly greets them and takes them to their usual table. Xavier, the server, brings each of them a glass of water and takes their order. As Linda and Mary Louis wait for their food, both of them use their wearable device to send messages to their respective family members. Then, Linda receives a personalized message with visual charts from her geriatrician describing the results of today’s tests. Her tests came back normal, and all vital signs are in good condition. Linda is pleased. She starts to make conversation with Mary Louis. The two friends talk about their day, health, family, and weekend plans. Soon, they are interrupted by Xavier, who brings their non-GMO, fat-free and gluten-free Mediterranean salads along with free radicals raspberry drinks. All the menu items are approved by the federal food act enacted in 2023 after the cancer pandemic of 2022. After their lunch, they decide to attend the senior center just a mile away. They want to take a craft and exercise class.

A polished wood cantilevered structure welcomes Mary Louis and Linda to the senior center. The modest one-story wooden building makes them feel secure and comfortable, as it reminds them of the buildings they saw grew up. A middle aged, chubby and short woman, Betty Whittier immediately greets them with a gentle smile. Ms. Whittier who is sitting at the front desk points towards the electronic reading device attached to the pristine cherry counter. Mary Louis and Linda each extend their hand, which has the smart device, to check in. A green light flashes twice on the counter, and both ladies feel a slight vibration from their respective devices. They have successfully checked in, and Ms. Whittier wishes them a good day.

Linda and Mary Louis are going to a jewelry class. They know where to go. The simple building circulation and different material textures helps them navigate towards the art rooms. The smart devices keep track of their location within the building. When older adults check in at the front desk, the smart devices pair wirelessly with the senior center's computer. In their first visit, older adults sign an authorization form allowing the facility to monitor their location and keep track of their vital signs. Thus, the facility's staff can know of Linda's and Mary Louis' location and relative health during their stay. This information is stored and analyzed by the senior center's computer, which alerts the staff in case of changing patterns or trends. There is a contract between the facility and its guests about privacy and sharing of their information. In exchange for free day care services, the facility sells guest's raw data to third party medical centers and health providers. Older adults that opt out of the Big Data market have to pay a monthly fee for similar services.

The jewelry classroom is painted light blue, and a digital screen outside the door displays simple graphics to describe its function. The screen changes with each class. At this moment, the screen displays large jewels with letters reading "Jewelry Class". The gals are ten minutes early. They sit on a long table with eleven students waiting for the art instructor. When the energetic Danish professor, Mr. Turner, commences classes, he provides several materials, such as copper, colored glass beads, plastic beads, charms, feathers, and thread. Linda decides to make a pink feather necklace for her youngest great-granddaughter, Mackenzie.

After two hours of jewelry making, the two friends decide to join the water aerobics class. Linda and Mary Louis go the changing area and get into their swimming attire by removing the outer layers of clothing. Both gals are wearing nanotech synthetic fiber bodysuits that functions both as a swimsuit and undergarment. The bodysuit adjusts to the water's temperature, and users do not feel a change in temperature when entering the pool. The water aerobics instructor, a Russian woman in her fifties, commences class with basic movements. This exercise class lasts for an hour, and the participants can remain in the pool after the end of class. Linda and Mary Louis stay in the pool for one more hour after the end of class. The ladies do not need to change into new clothes as the bodysuit dries automatically in less than five minutes. Then, the two friends check out and leave the senior center.

It is 6:23 P.M. when Linda drops off Mary Louis at her home. Meanwhile, the car has sent a wireless signal to the cooking oven alerting it of their proximity. The oven has started to cook the food Linda left inside of it. Linda arrives home, and the car drops her off on the front porch. The car then drives away to park and recharge. The front door automatically unlocks, and Linda enters the residence. James Jr. and P.E.R. are waiting for her in the living area. P.E.R. displays the house cleaning progress, and energy consumption and energy generation information on its screen. The basic diagrams and icons have green check marks next to them, which means the system is working properly.

"Mom, I opened the mailbox. You have several packages. I already put your groceries away, and the exoskeleton is here," says James Jr. pointing to the large opened box.

"Thank you son." Answers Linda as she walks over to the indoor mailbox.[9] She looks inside the mailbox to double-check that there are no boxes left inside. Meanwhile, James Jr. pulls out the exoskeleton, and P.E.R. starts to read the digital instructions. The exoskeleton is fully charged, and Linda tries it on immediately. She feels overwhelmed by the mechanical device, but James Jr. grabs her hand and reassures her.

"Relax, Mom. Breath. Close your eyes and clear your mind. Just imagine that you are walking." Says James Jr. as he tries to help her through the process.

Then, Linda starts to control the exoskeleton. She starts to walk slowly, taking small steps. The exoskeleton is light and requires little effort. Linda cannot believe she is moving so effortlessly. For the first time in many years, she can jump. Linda jumps frantically around the living room area for about two minutes. This achievement brings instant smiles to Linda and James Jr. P.E.R. is aware of the importance of this moment and records a video, which is sent to the rest of her family.

"Look, James. I am jumping! Remember when we used to run through the corn fields?" Linda gleefully asks as if she was talking with her late husband. James Jr.'s smile slowly turns into a sour expression.

"Mom?"

"Why are you calling me mom? James"

"I am not your husband. I am your son, James Jr."

[9] The mailbox is built-in on the exterior wall. It measures 5 ft. in width, 5 ft. in length, and 9 ft. in height. It has a standard automatic door on the interior of the house, and a rolling mechanical door on the exterior. This larger mailbox is ideal for online and grocery shopping as it is secured and can only be accessed by mail delivery personnel and house owners. There are no prototypes available. See Appendix B for my own prototype.

"Stop playing James. I don't like this game."

Analyzing this exchange, P.E.R. starts to play "Rockin' In The Free World" by Neil Young, which always reminds Linda of James Jr., and his rebellious stage as he went off to the army. Linda comes back to reality.

"Sorry Son. Can you help me out of this? I'm tired."

After taking off the exoskeleton, Linda decides to take a shower before dinner. Her smart bath capsule provides a rainfall showerhead. The bath capsule controls the water temperature based on previous patterns; Linda can also manually change the temperature. The bath capsule is designed to allow users to shower without moving. The user just needs to sit, and the machine will do the work. The water automatically mixes with shower gel during different stages to clean adequately. Sensors in the bathroom walls also measure temperature and program the temperature in adjacent rooms to provide a constant ambient.

It is 7:30 P.M. and Linda has changed into warm clothes. She walks over with P.E.R. to the kitchen area where James Jr. is sitting at the dining table. The blue light on the medicine dispenser machine is blinking again, reminding Linda to take her nightly medication. As Linda gets close to the dispenser, the eye scanner reads her biometric and pills are released. She ingests the pills and walks over to the table. James Jr. serves dinner; zucchini and Brussels sprouts hash. After Linda and James Jr. finish their food, James takes the dirty dishes to the universal washer. Linda and James go outside to see the sunset.

At exactly 8:30 P.M., James Jr. goes back to his house. Susan, Linda's daughter, video calls her. P.E.R. displays the live video feed on his chest screen. Susan, who is about to have dinner with her children, wanted to converse briefly with Linda. Within five minutes, Mary is also video calling Linda. P.E.R. does a video conferencing. Both Susan and Mary have been receiving updates about their mom's routine all day. These updates provide them a peace of mind. The three-way conversation lasts about ten minutes. Then, Linda video calls each of her three oldest grandchildren, which are away at university. They also have been receiving notifications throughout the day by social media feed updates. After the last video call, Linda decides to go back inside and sleep. She places her wearable device on the nightstand, which doubles as a charging station. Linda brushes her teeth, and she changes into her pajamas.

By 10:00 P.M. Linda is sound asleep on her smart bed. She has forgotten to turn off the bathroom and kitchen lights, but it is not a problem as RUM already taken care of them. Every day, Linda loses memories from her life. Medicine and music therapy slowed down the progression, but no treatment can stopped the process entirely. It is difficult for her to look in the mirror and see a distant reflection of herself. She is scared of what is to come, but she takes comfort in her faith. Every day before going sleeping, she recites 1 Corinthians 13: "So now faith, hope, and love abide, these three, but the greatest of these is love."[10] She is certain that Love from her family will always be there as dementia slowly takes away the rest of her life.

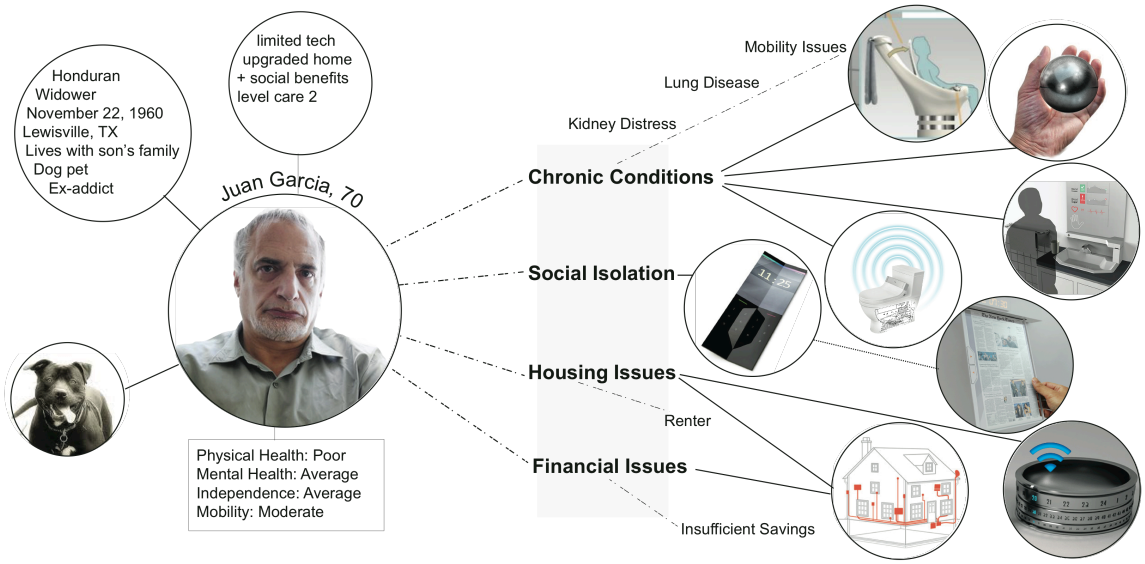
[10] 1 Corinthians 13:13 And now these three remain: faith, hope . Last modified May 1, 2015, http://biblehub.com/1_corinthians/13-13.htm.

This is a day in the life of the theoretical older adult, Linda, who is 75 year old. She suffers from stage 2 dementia and without the help of smart technologies and federal policies, her health and life would be much different. Linda's wishes to age in place and live alone are made possible by the proposed policies. In a current situation, an older adult suffering from dementia would be unable to live alone for long. He or she would be prematurely hospitalized, which could result in premature death. But, as Linda's health deteriorates, she can continue to age in place as the smart home technologies, healthcare, and social services are personalized and easily available. Her family can support her through the process without having to be with her 24/7. For further information about specific policies see chapter 8. The following case study examines the life of Juan, an older adult who distrusts technology and would rather live with his son than independently.

CHAPTER 5: JUAN

OPTIMISM IN THE SUBURBS

Chapter 5: Juan



Source: Guadalupe Aguilera Corona ©
See Appendix C for older adult tech comparisons and sources.

The second case study of the hypothetical older adults is for a Latino man who was born in the United States to Honduran parents and has lived all his life in Texas. He is strong, willful, and distrusting of others and technology. Due to his unhealthy lifestyle early in his life, he is suffering from several chronic conditions, such as lung disease and liver distress. In his early years, he lost his wife, job, and home. Fortunately, he is living with his son and family, but he has to pay rent with his retirement savings. He spends most of his time at home, as he does not have many friends. However, health and financial circumstances have compelled him to tolerate technology. He has come to appreciate the governmental assistance program for older adults, the Tri-Net. This case study demonstrates how policy changes and technology can help older adults to cope with health and financial issues. The following story represents a typical day in his life in the year 2030.

Juan Garcia enters his living room area and grabs a 2.5" diameter metallic ball that is suspended in its case. The round Smart Health Assistant quickly scans his blood, takes his pulse, temperature, blood pressure, body-mass, sugar level, and muscle strength. He releases the ball and places it back in its sterilized UV case. His first self-check is completed. Years of smoking and drinking have caught up with Juan. His lungs show an abnormal mass, and his kidneys show signs of distress from all the years of alcohol consumption. In addition, his skin makes him look older than his actual age. To monitor his health, Juan does self-checkups twice a day. Juan uses the Smart Health Assistant and a smart toilet, both of which run diagnostics and send information to the geriatric doctor's office by the cloud.[11] If there is a health concern, Juan receives a call from the doctor's office; otherwise, Juan just receives a text message with the status of his vital signs.

Two years previously, Juan had started self-recording for the American Family Ancestors project. The following recording appears online on one of the familial ancestry websites:

> "We had a good life—three kids, four grandkids, and our own house. All my kids graduated college, and I came from a family of eight children who all worked the fields to support the family."
>
> "I was born on November 22, 1960 in El Paso, Texas. My parents, Jorge and Sara, were migrant farm workers from Honduras, and they had

[11] A smart toilet can measure physiological signals using discharged body fluids. The smart toilet connects wirelessly to the Tri-Net and can analyzed body fluids to run diagnostics and send results to doctors and health care providers. This product is a type of remote diagnostics or lab-on-a-chip, that permits home application of tests at a fraction of the cost of traditional laboratory tests. Japan has built smart toilets for over a decade, but none so far run remote diagnostics. For further information: *The New Era of Connected Aging: A Framework for Understanding Technologies that Support Older Adults in Aging in Place* (Berkeley: University of California, 2014), 7 and 15.

> eight children. I was the youngest of them all. There was a fourteen-year age gap between my older sister and me. We lived in a run-down townhouse. There was barely any personal space and privacy. My siblings were expected to work around the house or work the fields when they reached the age of six. However, by the time I turned six, our family was financially stable from the salaries received by the older children, and I did not have to work. I was able to enroll in school and go every day. This was a privilege in our family, but I was also held to a different set of standards. I graduated from high school, which was uncommon for kids my age living in the same neighborhood. In a way, I was a big fish in a small pond. This seemingly privileged life allowed me to integrate successfully into American society. Apart from my dark complexion and black hair, I blended in with everyone else. I acted and spoke without a hint of an accent. I was an American and not a Honduran living in America. ” Juan pauses as he contemplates what he is going to say next.

On the morning of October 18, 2030 A.D., at 9:00 A.M., a segment of the IMAX screen displays traffic activity on the quantum mission control, QMC, of Lewisville, Texas. Footsteps and clicking sounds echo through the dome-shaped room. A team of 45 people from different city departments sits and works together to run the city efficiently. Constant incoming data from sensors has been running through sophisticated algorithms, and the resulting pattern suggests that a traffic accident will occur within an hour on the interstate towards the city of Dallas. The QMC has sent alerts to city residents.

Within a 10-mile radius, the semi-smart house occupied by the Garcia family has provided two alerts to the smart devices, one about the upcoming traffic accident and the second about the occurrence of the traffic accident. It is 9:30 A.M., but Juan is taking a nap alongside his faithful seven-year-old pit bull named Bubba. Bubba wakes up, and he wants to go outside, and he starts to lick Juan's hand. The constant licking and movements of Bubba wake Juan up. He gets up from the sofa and goes to open the back door. As Juan waits inside the kitchen area for Bubba to finish his business, he picks up a thin screen the thickness of a sheet of paper, which displays the daily news from the big national newspapers by subscription.

Juan's self-recording say the following about his life and family:

> "At age eighteen, I moved out of the family home. With my high school diploma, I was able to obtain a manufacturing job with great benefits and a pension. With some cash saved from working weekends in the farm fields, I rented a small one-bedroom apartment over a shop. Life could not have been better. On weekdays, I worked from 6 A.M. to 3 P.M., and after work I played baseball with a couple of guys from work. Those days were some of my favorite moments of my life." Juan loudly laughs.
>
> "At work, I met the love of my life and my future wife, Karen. Karen Johnson was the daughter of John and Shirley Johnson, whose family traced its roots to Texas Independence for over a century. Both families were against our union, but we did not care. We eloped. We married in a

Catholic parish with a priest I knew along with ten of our closest friends." He pauses, still smiling from having told one of his proudest moments.

"In less than two months, Karen was expecting our first child. At the birth of Michael, both families finally accepted our union and became civil with each other. Soon, Michael was crawling, and Karen was expecting our second child, who turned out to be a set of twin girls, Jennifer and Jessica. After the twins, we decided not to have more children. Karen was a full-time mother and wife. With my new promotion at work, we decided to purchase our first home in Lewisville, a suburb of Dallas. The house was a three-bedroom, two-bath bungalow style brick house. It had a front yard and a fenced backyard. This house was perfect for our growing family."

Bubba barks at his owner, bringing Juan back to reality. The dog enters the home, and Juan presses a button from the kitchen to close the sliding door. Juan goes to feed Bubba as Nicole comes into the room. Nicole is his daughter-in-law who married Michael. Juan is permanently living in their house. She is dressed in pink and black scrubs, wearing a medical device on her wrist, an upgrade from the pager that previous generations had worn. It is 10:00 A.M. and she has time left to eat breakfast with Juan before going to work. Both sit down at the kitchen table to eat almond soy milk and toast.

"How are Ethan and Matthew?" asks Juan about his two grandchildren who are in college in Austin, TX.

"They are coming home over the weekend," Nichole says casually. "Ethan sent me a text today." She is aware that Juan does not like to use social media and other technologies.

"That is great news! I can make them something in my crafts class today," Juan says ecstatically, as he has not seen them in a while.

Nicole's left wrist vibrates, and she has to leave; there is an emergency in the hospital. She programs the house to be in nurse mode, which means that extra monitoring will be needed.[12] The nurse mode will also record Juan and send a live feed to selected users, such as Michael and Jessica. In addition, the devices will monitor Juan's activity level, if he is inactive for more than two hours sounds and lights will sound until he moves around. The system will also grant access to the private elder company that takes him to doctor's visits, shopping, and sometimes to adult day care. Nicole leaves, and Juan and Bubba continue to eat.

Juan's online profile for the familial website also includes the following about his troubled past and family support:

> "You never truly notice the pace of time, until it is too late. The children grew up, and the twins moved out of the house. Michel went to community college while working nights. He barely spent time at home.

[12] The nurse mode provides informal care and support to older adults in their homes. This mode monitors an older adult's activity, sleep, mood, safety, and medication schedule through sensors, cameras, lights, and sounds. The computer analyses patterns and behaviors, and alerts informal and professional caregivers of changes in trends. For instance, the activity monitor measures steps taken, speed, calories spent, and amount spent in rest or without getting up. An older adult's activity is monitored through sensors and cameras, and activity charts are sent to caregivers. For information: *The New Era of Connected Aging: A Framework for Understanding Technologies that Support Older Adults in Aging in Place* (Berkeley: University of California, 2014), 6-15.

Within three years, Michael had an associate's degree in accounting and used it to work as an assistant in an accounting firm. He put off going to a university as he saved to pay for tuition. Michael worked hard to become a licensed accountant. He achieved his goal and finally moved out of our home. In less than a year, he met a girl from Puerto Rico named Nicole at his job. He fell head over heals for her and asked her out. She accepted him after months of courtship, and they married two years later. Together they had two children, Ethan and Matthew," Juan recalls proudly.

"The twin sisters both attended university in Austin for four years on scholarships and loans. They got married out of college and became pregnant around the same time. They had healthy children: a girl for Jennifer and a boy for Jessica. They would often drop the kids at our house, and Karen baby-sat for them. I continued working at the manufacturing plant but had to give up the baseball team. My wife needed me." He says this with a deep grave voice.

"Karen passed away from invasive ductal carcinoma, IDC, in 2005 at the young age of forty-one.[13] I was unable to recover from the grief and loss. She had been my life for twenty-seven years," he says with a cracking voice, and he takes a long pause.

[13] Invasive ductal carcinoma is the most common type of breast cancer. The cancer starts in the milk ducks and spreads to the surrounding breast tissues. Over time it can spread to lymph nodes and other parts of the body. According to the American Cancer Society, more than 180,000 women are diagnosed with this type of cancer every year. There are two broad categories of treatments—local treatments and systemic treatments. In the case study of Juan, Karen was diagnosed too late. She received the local treatment for the tumor and surrounding area, but the cancer came back. Last modified May 1, 2015, http://www.breastcancer.org/symptoms/types/idc.

"I fell into a deep depression. Alcohol was my only pain reliever. My children were unaware of my alcoholism. Soon I was unemployed, and my pension was gone. Without a steady cash flow, I stopped sending mortgage payments. What was the point? As the bank stopped receiving payments, a banker called me and warned that I could face foreclosure. Several red letters followed in the mail. These letters were left unopened on the kitchen counter with the rest of the other letters and bills," Juan says.

"When Michael finally came to check on me, he noticed the disorderly state of the house and all the mail left unopened. He came upon the red letters and discovered the graveness of his father's problems. He quickly opened the rest of the letters, while I slept on the sofa. I sobered up just before sunset. Michael had a serious conversation with me. We both agreed that I needed to get my life together and move in with Michael and his young family. Given that my house was almost paid off, it was easier for them to move in with me and to rent Michael's home to another family," he says with a hint of optimism.

"I felt angry because they were treating me like a child, but I also felt loved. I agreed to attend Alcoholics Anonymous. Unfortunately, I gave up drinking and picked up smoking. I smoked in secret when Michael and other family members were not around. At that time, I was smoking a pack a day. Now, I regret that decision. I wish that I had listened and

believed the anti-smoking campaigns. It is too late. My lungs are not working properly. I fear for my health," Juan pauses.

It is past 11:00 A.M. and Juan sits down to watch the tube while Bubba sleeps near his feet. As he watches old rerun shows, the program is interrupted by a call. A new window appears on the screen with the picture of Jessica and a message asking if the user wants to accept or deny the call. Juan presses a green button on the universal control to allow the call, instead of accepting it by voice command. Juan prefers traditional forms of technology—those that were available during his early adulthood.

"Hello, Dad?" Jessica cheerfully asks.

"Jessica, I'm here," says Juan.

"How are you doing today, dad?"

"Good. Just I finished eating with Bubba. How is work?"

"It's been a busy day at the center. What are you doing today?"

"I'm thinking about taking Bubba for a walk."

"Great. You should also go to the senior center today, dad."

"You think so? Well, maybe I should." Juan accepts after a few minutes, and asks Jessica to make an appointment with the elder house care services.[14] The conversation ends, and the T.V program continue where it left off.

An hour later, a new window with an icon of a duck dressed in doctor's attire appears on the tube along with an alarm sound. A friendly duck wearing dark frame

[14] Third party home care services help with in-home care for older adults. They help with daily activities of living. Their services range from companionship and helper, personal services, dementia care, transitional care, and hospice support. Under the Elder Administration program, see chapter 8, these services are subsides depending on the older adult's level of care. Thus, Juan is on level care 3 and he receives 50 percent of the cost of home. Last modified May 1, 2015, https://www.homeinstead.com/recognize-the-signs/.

glasses in a white lab coat reminds him to take his medicine. Juan knows that he must take the medicine; else the alarm sound will not stop.[15] Bubba distinguishes the sound, and he goes back to sleep. Juan gets up and walks to the kitchen wall, where a white dispenser showing different colored pills is mounted. A red light on the medicine dispenser is flashing. As he gets closer to the machine, the retina camera scans his eyes and unlocks the gate. Several pills are dispensed. The medicine dispenser shows diagrammatic images demonstrating how the pills are to be taken. Juan ignores the diagrams and takes the pills dry. Cameras and sensors in the house detect that Juan has taken the medicine. Then, the duck on the tube congratulates him and disappears, and the alarm sound stops. Juan goes back to the living room to continue watching the show.

Within a half hour, Bubba wakes up and goes to stand next to the glass sliding door. The dog wants to go to the bathroom. Although the door can open automatically, Juan prefers to open it manually and watch Bubba behind the glass door. Juan gets up and opens the door. It is a nice, sunny morning in May. Juan decides it is time to take the dog walking around the neighborhood. Bubba comes back inside the house. Juan gets dressed and puts Bubba's harness on. The harness is equipped with sensors that monitor the dog's health but can also send a distressed signal if something were to happen to the owner. They leave the house, and Juan presses a button on his smart device to lock the doors and windows. The house's computer sends notifications to Juan's family about his departure.

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[15] The window display and sounds are part of medical adherence program, which falls under the nurse mode. The medication adherence program provides medication reminders via interactive voice response and text messaging. The program comes with built-in sensors and scanners, so the back-end system can confirm if the right medication has been taken. For further information: *The New Era of Connected Aging: A Framework for Understanding Technologies that Support Older Adults in Aging in Place* (Berkeley: University of California, 2014), 6-15.

The neighborhood had remained almost the same since Michael first purchased the house. A few homes have been renovated to include smart technologies, and about two new smart homes have been constructed. Juan lives in a semi-smart house, which was remodeled in 2020 A.D. The renovation added smart devices and sensors to connect with the Texas Tri-Net (Appendix D). It does not have a central computer like the new smart homes; rather it uses a smaller decentralized computer to connect to other smart devices and appliances. Juan and his family decided to remodel the existing house rather than to build a new house, as it was within their budget. His savings from the retirement account would not have covered the new home, plus Juan did not want to live alone again. Thus, he decided to use his savings to upgrade Michael's house.

Juan's self-recording explains the troubled situations that convinced him to connect to the federal Elder Administration program, the Tri-Net:

> "In a span of ten years, my house was paid off, I was sober, and I had a job with Wal-Mart. My children and grandchildren were also doing great. Michael opened his own accounting firm. Nicole was able to attend community college and graduate with a certificate of nursing. Ethan and Matthew grew up healthy and happy, and both graduated high school. However, as time passed, I realized that Michael and Nicole needed space. I gathered my family and told them that I was ready to live and support myself. They reluctantly agreed, and Michael and Nicole decided to move back to their house." Juan pauses as he tries to arrange the next sentences.

"I was able to live independently for a year. Then, I fell back into old habits when I started going out with my old baseball buddies. Most of them were divorced and were enjoying their newfound freedom. We would meet up in the local bar every weekend. I resisted drinking for a few months, but I smoked more to lower the desire to drink alcohol. Back then, I smoked about two packages per day," Juan closes his eyes and shakes his head.

"During one conversation with my old buddies, I realized that my home was too big for me. I gathered my children again and told them that I would be selling the home, and putting the sale proceeds into a retirement account. Meanwhile, I rented a one-bedroom apartment close to Michael's," he says with sorrow in his eyes.

"Within a few months, I started drinking alcohol again. Moderately at first, but it soon became an addiction. I lost my job again. My children had an intervention, and by my sixty-fifth birthday I was back living with my son." Juan says it with shame.

"Once I was living with Michael permanently, we decided to upgrade the house. I applied for elder housing benefits at the Lewisville Elder Benefit Office. The social worker, Maria Hernandez, explained the different housing options and benefits available to me.[16] After expressing

[16] Maria Hernandez is a 2025 graduate of the Dallas Community College with an associate's degree in elderly service provider. Maria is part of a Federal sponsored elderly services initiative that provides $30 billion annual budget for education, see chapter 9. "I was one of the 1200 elderly service providers in my class, out of 606 who were minorities. I choose housing the housing specialty as 40% of minorities in Dallas still have affordability problems." Says Maria for her online self-recording.

my desire to live with my son, Ms. Hernandez provided us with a list of the tax credits available to remodel the home. She briefly explained the benefits of upgrading the home and connecting it to the Texas Tri-Net. I was skeptical about the information, as I was never one for technology. Allowing a third party to have easy access to my personal information at home did not sit well with me. I did not understand the usefulness of 'Big Data'. Seeing my hesitation, Ms. Hernandez made a follow-up appointment." He pauses.

"Prior to the meeting, the family gathered at Michael's house, and we discussed the idea of a smart house. We all agreed it was better to upgrade the home. Then, at the Elder Benefits Office, Ms. Hernandez went over the tax credits that could be used to purchase the house technology. She gave us a list of providers and other product information. She explained that the house would need three components: a decentralized computer, sensors and cameras, and smart appliances. Ms. Hernandez also expressed the disadvantages of a semi-smart house which are energy consumption and bills. That is how our house became smart. It was one of the best decisions I ever made," he says proudly.

During this time, the younger generations are at school or work, but older adults are active on these neighborhood streets. Juan and Bubba start walking. Betsy, an older neighbor who likes to sit on her porch, waves to Juan. They have known each other for more than two decades, and sometimes they meet in adult day care. As Juan continues

walking, he meets with Hyun and Hye, a South Korean elderly couple who also attend the same senior center. They exchange brief words. Juan starts to walk slower, as his lungs have stressed. He is wearing a nanotech bodysuit that controls his body temperature and helps regulate his breathing. The smart fabric distributes forces around the body, making it easier for him to walk. After an hour, Juan and Bubba arrive home exhausted. The fridge has automatically dispensed a cold cup of water after having received a wireless signal by Juan's smart device.[17]

At exactly 3:00 P.M., the elder care assistant, Jerry, arrives at Juan's home. Jerry is a certified elder care assistant working with a third party agency. He sees several elderly customers during the day and performs diverse tasks depending on their needs. Today, Jerry will be taking Juan to the senior center. A week ago, Jerry took Juan to see the Geriatric Clinic of Lewisville for advanced medical tests. The elder care facility has self-driven cars, which allow the care assistant to devote time for each customer. In Juan's case, the assistant provides minimal services during hours when Juan's children are working. The services are partially covered by the federal elder program, and it is cheaper to pay for these third-party services, rather than having one of the children take days off work.

Jerry and Juan arrive at the adult care facility. The senior center was renovated from an old factory storage building. The building's metal structure contrasts with the brick walls. It is a simple box-shaped building with brick cladding. A metal and glass

[17] The ability of devices to communicate with each other wirelessly on behalf of users with a minimal interface is called usability. Usability is the ability of an object to perform a task without the user having to intervene. The user just needs to know the function of the device, for instance Juan's smart device sends a wireless signal to his refrigerator simply by being in close proximity and analyzing previous data, all without Juan's command. For further information: David Rose, *Enchanted Objects* (New York: Scriber, 2014), 189.

awning suspended with cables welcomes guests. Jerry greets the receptionist and checks in at the front desk with his smart device. Juan will have to stay at the facility until Jerry picks him up and checks him out with his smart device. Juan puts on a smart wristband that will track his location and vital signs while he is at the center. Jerry remains in the facility until Juan enters his first group activity, aerobics. Jerry will be back in two hours as scheduled.

The aerobics class is full today, as it is one of the most popular classes in this center. Ms. McAlister, an African-American woman around the age of fifty, teaches this class. The pace and the exercises are gentle and easy to follow. Music hits from the 40s through 70s play in the background. The participants begin to warm up while they chat with friends. Juan exercises by his friends, Ana and Patricia. The participants exercise as his or her body permits. This class lasts for an hour, but the participants are welcome to take breaks and exercise at their own pace. Ana, Patricia, and Juan stay until the end of the class. They are tired but smiling for having finished the workout. Their bodysuits automatically dry them off, and they head out to the common area.

The trio decides to relax in the common room. The design of this room is tropical—several plants and water features, such as water fountains, decorate the space. The common room has many types of furniture, such as love seats, chairs, benches, beanbags, and hemlocks. There is a small cold-lunch refrigerator by the entrance. Guests take the food items they want and use their smart devices to scan the items to their account. At the end of the day, guests pay their balance or charge to it their bank account. The cold-lunch program functions on the honor system. Local stores have donated most

of the food items, and the sale proceeds are invested back into the day center. Juan and his friends get water, and they sit by a water fountain on comfy chairs.

After an hour, they decide to go to pottery class. Pottery class uses cutting edge technology, such as clay that can be cooked with microwaves.[18] This technology is cheaper than running a traditional kiln, and it allows pottery makers to have their creations within minutes. Today's class is smaller, as many of the usual participants decided to try the new piano class. The trio sits together on a table, and the synthetic clay material is resting in the middle of each table. The teacher, Mr. Wang, is observing and helping the students. Everyone works independently, letting his or her own imagination take over. After 45 minutes, Juan has created two key chains for his grandsons, Ana has created a figure of a cat, and Patricia made a star necklace for her granddaughter. They cook the pieces in individual microwaves and within minutes the pieces are done. Ana and Patricia will stay longer, but Jerry is already waiting for Juan in the lobby.

It is 6:00 P.M., Michael is back from work, and he is sitting at the kitchen table going over financial documents while Bubba is resting on the floor by his chair. As Bubba hears a car, he gets up and begins to wiggle his tail excitedly. Michael knows his father is back home. The door opens and Juan steps inside the house. He is happy to see Michael. Bubba is licking his hand, welcoming him. Unfortunately, Michael does not have good news for his father. He has received the results from the X-rays, and the mass on Juan's lungs has grown. Juan's geriatrician, Dr. Devan Williams, contacted Michael to

[18] Microwavable clay is not currently available for sale. There are polymer clays, called plastic clays, which some people cook in the microwave following a careful procedure. The procedure is for small projects, and it involves using a Tupperware container with water; the amount of water is proportioned with the size of the clay work. The procedure is limiting and complicated, and manufactures of the clays advice not to microwave the clay. Thus, the new clay material will solve the current issues with the plastic clays. Last modified May 1, 2015, http://www.wikihow.com/Soften-Polymer-Clay.

tell him the grave results. Juan will need an operation immediately to remove and transplant new lungs.

Juan greets Michael, and they sit down to eat. Michael has cooked steamed vegetables and beans. Just before serving the meal, Nicole enters the house. She is early from work after hearing the bad news about Juan's health. She greets them and washes her hands. Before eating, they hold hands and say a prayer. They start to eat and have light conversations about their individual days. After dinner, Michael takes the dirty dishes and cups to the universal washing machine.

"Dad, can you stay? There is something we need to discuss with you," says Michael.

"Sure. What is the matter?" Juan asks, knowing that what he is about to hear is not good. Michael invites Juan to sit down in the living room. Nicole and Michael sit on the same sofa facing Juan.

"Dad, we are your family, and we only want what is best for you," Michael starts.

"Your health is our priority, Juan, " intervenes Nicole.

"We will do whatever is necessary to keep you in good health, dad."

"Yes, Juan," says Nicole as she grabs Juan's right hand, and Michael places his hand on Juan's shoulder. "Your results from the x-rays came through today," she says sourly. "The mass has grown," Nicole gently says.

"You need a lung transplant as soon as possible, dad," Michael steps in the conversation. Juan is speechless. "Everything will be fine. The surgery is fairly standard,

and the lungs are grown in a lab. Thus, there is no waiting list," says Michael with a positive voice.

"Yes, it will be costly, but we can all contribute and pay for the extra cost not covered by Medicaid," ends Nicole.

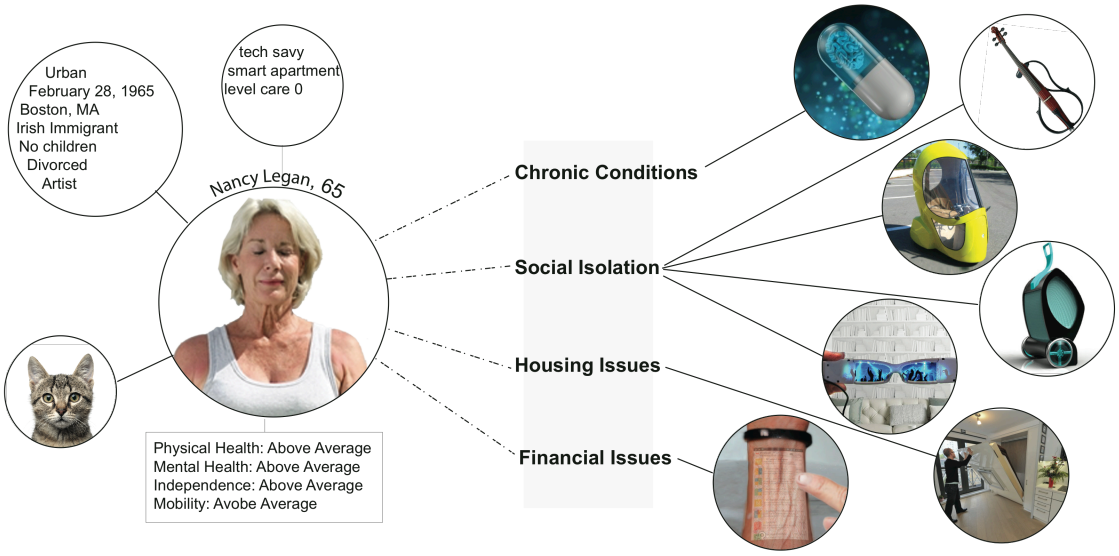
"I need time to digest this information. It's too much for me, but I do want to live longer. Let's pick this conversation up tomorrow," says Juan. Nicole and Michael stay with Juan in the living room for a while, just pretending to watch what is on T.V. Each person is thinking of the upcoming transplant and how it will affect everyone in the Garcia family. After an hour, Juan takes a shower with Bubba. Nicole and Michael go to their room. Both are dried automatically inside the white capsule. Juan gets dressed and goes to sleep. Tomorrow will be a new day, and soon he will have a new set of lungs grown by science. What a time to be alive!

This story demonstrates the theoretical life of Juan, a 70-year-old man living in the year 2030. Without the policy changes and technological advances proposed, he would not be able to age in place. His health would be worse, or he would be dead, as he would need a lung transplant soon. He would also be in a worse financial situation if the housing, health care, and social service policy would not have covered most of the cost, and the systems were not integrated. For further information about the particular policy, see chapter 8. The following case study examines the life of Nancy, the youngest of the case studies, who is expected to live at least to age 110.

CHAPTER 6: NANCY

OASIS IN URBAN CHAOS

Chapter 6: Nancy



Source: Guadalupe Aguilera Corona ©
See Appendix C for older adult tech comparisons and sources.

The third case study of hypothetical older adults living in the future is a free spirited woman. She is peaceful, passionate, adventurous, compassionate, independent, courageous, and non-traditional. During her early life, she took risky health decisions, which are starting to pay off. An artist by profession, she has a unique perspective on all aspects of her life. Unfortunately, she is divorced, childless, and her core family is dead. She has a few close friends, but no family members to take care of her in old age. Her current financial situation is above the medium average, but as she gets older her income will drop. The drop in income combined with her deteriorating health and no family support will be a major issue. She might not be able to pay for the medical costs, living expenses, caregiver costs, and she will end up in a nursing home. However, this case study demonstrates how policy changes and technology can help older adults regardless of their assets and income to cope with health and financial issues. The following story is a typical day in the life of this woman in the year 2030.

Sunrays filtering through the window blinds illuminate the cozy mint color bedroom apartment. The thin body of Nancy Legan wrapped in a cotton sheet lies in a white frameless bed. She slowly wakes up, gently opening both eyes. The bed is comfy and warm. Nancy decides to stay in bed for a few more minutes. The sun continues to warm up the room as she meditates. Minutes later, she is fully awake and ready to begin the day having recharged her *chakras* under the sun.[19] Nancy gets of out the bed energetically, picking up the crystal necklace and the smart wrist device from the nightstand. She makes up the bed, as the blinds automatically open. Nina, the sassy gray cat, wakes up from her carton box. The cat is not happy that more light is entering the room, but she continues sleeping regardless.

It is a beautiful sunny day as seen from the southeast side of the 16th floor in the Belle View Senior Apartment Tower in Boston, Massachusetts. Each room in this apartment complex has an individual computer system that connects to the Massachusetts Tri-Net (Appendix D). The central computer starts to play techno music, and Nancy starts her morning routine. She starts by stretching and warming up her muscles. The music switches to Zen sutras songs automatically when Nancy gets into a yoga posture. A combination of different yoga poses helps her keep muscles toned. She ends her routine by getting into the lotus position, closing her eyes, and meditating.

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[19] In yoga, mediation and Ayurveda, Chakra refers to the wheels of energy throughout the body. There are seven main chakras—root chakra, sacral chakra, solar plexus chakra, heart chakra, throat chakra, third eye chakra, and crown chakra. Each wheel of energy corresponds with massive nerves and major organs. These chakras must be aligned and opened for an individual's well being. If there is a blockage, energy cannot flow, and it can lead to illness. To align the chakras a person meditates to become aware of the energies. Last modified May 1, 2015, http://www.chopra.com/ccl/what-is-a-chakra.

"Hello, Nan. Are you there?" A voice coming from Nancy's smart device ends her meditation. Biljana, her best friend, is calling her. Nancy waves her right hand, and the apartment's computer connects the call.

"Hello, Billy. I just finished with Yoga. How are you?" Nancy gets up and goes to the kitchen. Nina lazily follows behind.

"I'm fine. I'm just getting dolled up to visit the market. Want to come?"

"Sure. Give me about an hour." Nancy talks freely without having to put any device in or close to her ear. She goes to the counter and grabs a can of food for Nina.

"That's perfect. I will come to your place, and we can walk from there."

"See you in a few," Nancy says as she pours the food into Nina's bowl.

The small, 600 square-foot apartment has an excellent view of the city of Boston. There is a kitchenette that doubles as the laundry room, due to the size and ergonomic design of the appliances. The open floor plan allows for multiple room functions. The living room area transforms into an office space or guest room with the multi-purpose furniture. There is a powder room by the entrance. The bedroom is located adjacent to the living space; it has a large open window and a large private bath.

Nancy walks to her private bathroom where a medicine cabinet is mounted on the wall. Inside, there is a smart medicine container with rejuvenating pills. She has been religiously taking them every morning for over a decade. The red pill is the size of a mustard seed. Once she has digested the pill, she goes back to the kitchen.

Yesterday, Nancy started to self-record her life history for the ancestry website. The following is part of her information on the anti-aging drug:

"I decided to take the famously called 'Antiaging Elixir' back in 2020, which has the compound called rapamycin.[20] This drug slows down the aging process, and reduces damages to cells. Marketed as an alternative medicine to prolong life, I decided to try it. Several articles and reviews were written about its health potentials, but there was not sufficient data to receive FDA approval. The pills were expensive and not covered by my private insurance or Medicaid. Making a decision on a hunch, I decided to invest my money in the pills. I could either lose all my money or gain years of life. Looks like I was right, " says Nancy laughing.

"In the beginning, I did not see or feel noticeable results. Increased energy was the first sign of change in the second half of the year. This was followed by a faster metabolic rate and improved digestive system. Then, around the thirteenth month, my nervous system and immune system were better. I could concentrate longer and retain more information. I would also not get as sick as often as before taking the pills. Soon, I started to do aerobic exercises to keep up with my increased metabolic rate. I gained back muscle and flexibility, which I started to lose around the age of forty.[21] The daily exercises brought on noticeable psychological changes. I

[20] The mTOR inhibitor rapamycin research first demonstrated that the compound could extend the life span in mammals. Rapamycin slows down the rate of aging and the damage it can do to certain cells. In the mice experiments, those that were given the drug tended to live longer by 20 percent, compare to those that were not taking them. The compound also slows down aging in mice that start old, 20 months or the equivalent of 60 years in people. Rampamycin is currently used in organ transplants, to lower rejections of organs. However, the drug has side effects such as higher change of developing diabetes and risk of cataracts. Last modified May 1, 2015, http://www.jci.org/articles/view/67674.

[21] Dr. Luigi Ferrucchi, director of the National Institute on Aging, says that everyone lose muscle and gain fat at 40 years of age. Thus, it is essential that people exercise in order to avoid muscle decline. For more information: Mandy Oaklander, "Stretch Your Timeline," *Time,* February 2015, 80.

was happier and felt much younger. My family and friends also noticed my improved health and outlook on life," as Nancy says this, she smiles.

"As the years passed, friends similar in age began to become frail and weak. There was an evident health distinction between us. Did the pills work? That was the question my friends kept asking me. Dr. Carter, my geriatrician, ran several tests, and the results were conclusive. I was in excellent physical health, and in the top five percentile for my age. However, Dr. Carter could not legally attribute my improved health to the pills. Some friends said that I was healthier because of the placebo effect.[22] Regardless, I continued to take the pills as I believe in their health properties. So far, I have not needed any major surgery, nor have I had anything beyond a common cold." She laughs, bringing her hands to her face.

"Nina. There you are. Are you finished with your food?" Nancy asks looking to the furry ball currently rubbing up against her leg.

Nancy goes back to the kitchen to make Chock-Full Oatmeal breakfast. She starts by cutting blueberries, raw almonds, apples, blackberries, a banana, a pineapple, and a mango with a gyroscopic knife.[23] The oats have been cooked in a timed pan. The stove and pan had been set to cook slowly by the apartment's computer before Nancy woke up.

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[22] A placebo effect or placebo response is the phenomenon in which a fake treatment can improve a patient's condition due to the person's expectations that it will work. Last modified May 1, 2015, http://www.medicinenet.com/script/main/art.asp?articlekey=31481.

[23] A gyroscope is a device that maintains its orientation regardless of movements at the base. There is a prototype spoon called Liftware, which is designed for people suffering from Parkinson's, and can cancel 70 percent of tremors. Last modified May 1, 2015, http://www.liftware.com.

She mixes the oats with cinnamon and brown sugar, before combining it with the rest of the cut ingredients. The complete meal smells and tastes delicious. She sits down to eat at her kitchen table, which was folded into the wall.

Nancy goes to get dressed and dolled up in her bedroom. She settles on a white long maxi Bohemian dress. Underneath the dress, she has a smart bodysuit. Meticulously, she puts on multiple layers of toner, UV creams, and foundation. All the products have chemicals that rejuvenate skin cells and add collagen. There is not a visible wrinkle on her face. Her skin does not look a day past 40 years of age. A particular foundation product fills in her cheeks. This product lasts all day, and it is waterproofed. She ties her hair and puts on a straw hat with a green ribbon and pink flower. Semi-orthopedic white shoes are chosen for comfort and better support. Nancy is ready to meet Billy.

"Bye, bye, Nina. Mommy has to go out, but I will be back," says Nancy to the cat, which is resting on her kitty gym. The brain of the apartment announces the arrival of Billy. Nina goes outside before Billy knocks on the door.

"Hello, lady." Nancy warmly greets Billy.

"You look great Nan."

"You too Billy." Billy playfully winks at her.

The two friends are visiting Quincy Market in Faneuil Hall, which is within a 15-minute walking distance. Billy lives in the same senior apartment tower on the 18th floor. They usually walk to the market at least once a week in the summer months. In the swing

months, they take a compact electric vehicle.[24] In harsh winter months, the women rent an autonomous car. They like visiting the market because of the fresh produce and artisanal products. Today, both ladies are purchasing groceries, and they decide to drive Nancy's three-wheel vehicle. The small vehicle is parked in her storage room in the basement of the building.

Faneuil Hall is a historic site, which has original buildings from the eighteenth century, and few changes have been made. The biggest difference is the market stalls, which are covered by colorful fabric structures. The market is extremely crowded around 10:00 A.M., but the gals got there early. Nancy and Billy walk over to one of the fabric structures that have fruit and vegetable stalls. The stalls are arranged by color and produce type. The ladies start smelling and gently squeezing fruits and vegetables to know if they are mature. Nancy needs more berries, oranges, cucumbers, lettuce, and onions. She pulls out a recyclable bag for the purchases. They continue walking and looking around. Nancy visits a farm artisan stall, and she buys homemade lavender soaps and bath salts. A fresh fruit stand located in the center of the market sells juices and fruit cups. Billy and Nancy purchase mixed fruit cups and go eat on the benches. After looking around at other stalls, they decide to leave.

Nancy and Billy arrive back at the apartment complex. They parked the vehicle, take out a personal wagon, and get on the elevator. Nancy gets out first, and she waves goodbye to Billy. Nancy's purchases are carried by her autonomous wagon cart, which

[24] The compact electric vehicle is combination between a car and electric scooter. This vehicle comes with three wheels—two in the front and one in the back. This vehicle is ideal to be driven in cities, and it is big enough for two people. There are several prototypes, the most similar to the Nancy's vehicle is the Peugeot's HYmotion 3. HYmotion 3 is a hybrid vehicle and can reach maximum speed of 70 mph. Last modified May 1, 2015, http://www.tuvie.com/peugeot-hymotion-3-three-wheels-scooter-concept/.

follows behind her. All the floors in the smart building have a wireless motion sensor activated pad that detects movement and matches walking patterns to a person, object or animal.[25] As Nancy walks to her apartment, the building's computer recognizes her and the door to the apartment automatically opens. She unloads the bags and organizes the groceries in place. Nina jumps from the fridge to the counter and greets Nancy.

"Hey, there! Have you been good while I was away?" Nancy asks Nina as she strokes her back. The cat walks away and returns to her kitty gym. Nancy goes to store the soaps and salts in the bathroom.

Nancy receives a notification on her smart device around noon. It reminds her of the class scheduled in less than an hour. She has volunteered to teach an art class at the local senior center, indefinitely. It takes her twenty minutes via a rented autonomous car to arrive at the senior center. She has enough time to make some tea and read the news.

Nancy's decision to volunteer at the senior center is expressed in her online profile for the ancestry website:

> "About five years ago, I read in the local newspaper that volunteers were needed at the senior center for their adult day care program. I was not familiar with the federal elder program, but something inside told me to find out more information. I read several entries about the program and personal stories online. As I'm only sixty-five years of age, I can receive

[25] The foot pressure-based is a form of biometric identification, which uses the person's unique walking patterns to identify their identity. Based on the gait recognition literature and camera-based computer systems, a person's patterns can be identified with floor-based sensors. This form of biometrics is faster and does not require a person to stop, unlike other biometrics such as eye scanners. A prototype of this system is being research in Shinshu University in Japan by Todd Pataky. For more information: Todd Pataky, "Gait recognition: highly unique plantar pressure patterns amongst 104 individuals," *Journal of the Royal Society Interface*, (69), 790-800.

> partial government assistance, but I never bother to find out all benefits. Ultimately, reading a blog by a volunteer, who had personal stories about her experience, convinced me to sign up. I realized that I must live by example. Eventually, I too will attend daycare," Nancy says with sadness.

"Nina. Come here. Nina." Nancy calls the cat as she comes down from the kitty gym. "Momma needs to leave. She will be back, ok," Nancy says to Nina while petting her back. Nancy then leaves.

At St. Mark Senior Center, older adults and staff are occupied with their daily activities. Nancy arrives and signs in at the front desk with her smart device, which allows her access to guests' information, such as their names, age, ethnicity and health related disabilities or allergies. This information cannot be shared or discussed outside the center. Nancy heads to the administration office.

"Nancy, how are you?" Margaret, the center's manager, asks her.

"Hello, Margaret. I am great. How about you?" Nancy replies with a warm smile.

"Doing just fine today. We have a full center today."

"It should be fun. I have a great activity planned. I should go, my class starts in a few minutes," Nancy replies cheerfully and leaves.

Nancy walks to the classroom. Along the way, she encounters several of her previous students and few she has never met. She greets each of them with a warm smile. The door of the art classroom is open, and there is nobody inside. There is a coat locker at the end wall, and she places her belongings there. The wall cabinets have the materials

she will be using today. She takes out animated pieces of paper, special color pencils, special paint, and other smart drawing utensils.[26] Nancy places the materials on each table. Ten minutes before the start of class, students begin to show up. Nancy decides to greet each student by the door.

"Hello, Bob. Welcome to art class. Come on in. Find a seat." She continues to greet all the students that come into the class. The students continue to talk with each other until Nancy announces the start of class.

"Hello, class. Today we will be making fun little flip books. A traditional flipbook is composed of a series of drawings that change a little in order to create a moving picture when you turn the pages rapidly. However, the flipbooks that we are creating today are much different and exciting. With the animated paper, we are going to draw all the images in one piece, and the result will be a short film," Nina says clearly and loudly. She shows them five of her flipbooks and passes them around. Half of her flipbook samples have a 30-second animation related to dementia, as to send a positive and encouraging message about aging disabilities.

"I have placed animated paper on each table. You are welcome to use the smart pencil, color pencils, crayons, markers, paint, or whatever your creativity desires. Please ask me if you need help. I will be walking around," Nancy says and starts to do her rounds.

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[26] Animated paper is a fancy word used to describe a specialized screen. This screen has the thickness and folding abilities of sheets of paper. So far, LG has developed a flexible electronic screen that mimics a newspaper. This screen measures 25 by 40 centimeters and it is 0.3 millimeters thin. The electronic screens have been put in e-book readers such as, Amazon's Kindle. The company is researching into developing an e-newspaper that can update regularly with the latest new. Last modified May 1, 2015, http://www.techhive.com/article/186875/lg_display_develops_flexible_epaper_screen.html.

The class is running smoothly. Several students have asked questions regarding the subject and construction of the flipbook. A few students are working alone as they created them last year with Nancy. Everyone seems to enjoy the project. Most students are busy chatting about their drawings while they keep working, and others work in silence. Nancy is happy helping with their projects. By the end of the hour-long class, everyone has a flipbook. The last ten minutes are reserved to present the flipbooks to the rest of class on the big screen. The smart paper is wireless, it saves and sends the flipbooks directly to the screen. Students are asked to describe the subject of the book and explain why they chose it. The students tell many wonderful stories about their drawings, from a simple flower being pollinated by a bee, to a monster truck jumping through a ring of fire. The stories are entertaining, and everyone is laughing. The last flipbook is shown, and the class ends.

"Thank you, everyone, for coming. Today's projects have been excellent. I hope that each and every one of you had fun. I will be back in two days with an exciting art project. Until then, have fun and be safe. Class dismissed." Nancy smiles and wishes them farewell. She picks up her belongings and starts to walk back to the administration office.

"Hi, Margaret. I am finished with my class. I will see you in two days."

"Thank you for volunteering today, see you soon. Take care Nancy."

Nancy arrives home. It has been a long day, and Nancy decides to take a shower. The smart bathtub, which looks like a capsule allows her to remain sitting during the automated washing system. The bathtub has a five-step process—pre-soak, wash, foam

brush, gentle rinse, and blow dry. Today, Nancy decided to take a traditional bath with the salts she bought. The tub automatically fills with water, and Nancy adds her bath salts. She gets in and enjoys the warm water.

"Hello, Ms. Legan?" A voice calls from the smart wrist device. The device's screen shows the caller ID as Eileen Slosvki. Nancy, who is in still in the bathtub, accepts the call with her hand movement.

"I am calling in regards to the upcoming gallery collection. How much should the deposit total? And are you coming in today?"

"Yes, the upcoming gallery. The deposit amount should be $5,000 even. And I will not be coming in today. Tomorrow is more possible. I will check the account in a few minutes. Please let me know if something else comes up. Have a good day Eileen," Nancy says as she motions to end the call.

Nancy gets out of the tub and gets dressed in a clean bodysuit. She walks to her living area and turns the kitchen table into a desk, she decides to catch up with work. The Legan Gallery was founded in 2001 with the money Nancy received from her divorce settlement. She had been an artist for most of her life and decided to invest the money in art. The gallery is well known in the city of Boston, and it makes decent money every month. In the beginning, Nancy was active in the gallery's administration, but once she retired she took a passive role. Nancy hired Eileen Slosvki as general manager, and she has successfully been running the gallery ever since. Today, Nancy's bank is comparing

the checking account balance with receipts and payments made. The account balances and Nancy is pleased.

Nina comes close to Nancy, and she meows to get Nancy's attention. Nancy rubs her back and goes to the kitchen. She grabs a protein bar from the counter and goes back to the desk. The desk faces a window, from which Nancy can see the city. Today, Nancy will be recording the second chapter of her life for the ancestry website. She turns on the universal tablet, which is as thick as a sheet of paper, and it can fold. The tablet has a camera and biometric security features to log into her online accounts. Meanwhile, Nina sleeps in a box next to this chair.

Nancy starts her second session. The following is her recording:

> "Today is July 23, 2030. I am recording from my apartment in the city of Boston, in the United States. This is my second recording. My wish is that anyone listening to this recording can learn and take something away. Thank you for listening," Nancy says with a gentle smile.
>
> "My full name is Nancy M. Legan. I was born in Edinburgh, Scotland on February 28 in the year of the wood snake, 1965. I was the youngest of three children. I had two brothers: Alan and Grant. Regrettably, both of my brothers are dead; Alan died last year. We moved to the States when I was two years old. I consider myself an American, as I have only been to Scotland five times in my entire life," she laughs.

"When we arrived in Boston in December of 1967, it was cold and snowing. I do not recall this, but when I was growing up my brother Alan told me several stories. My father had rented a small apartment on the outskirts of Boston. The apartment had two bedrooms and one bathroom. The kitchen and the living room were combined in one big space. My brothers were older than me, and they attended elementary school. The extended family helped my parents settle down and get them manufacturing jobs." She pauses to recollect her memories.

"What I do remember is playing with my brothers in the neighborhood park. Since they were older than me, they would take me to the swingset and slide while they played with other migrant boys. The parents and kids knew each other and the park was safe. Eventually, I grew up and met other girls my age, and I began to play with them. Those were some of my happiest memories," she smiles again.

"My mother and father would work most of the day and would come home late at night. My brothers and I did not have a particularly close relationship with my parents, but we were well-behaved kids. Both of my parents are dead. My father was the first one to die twenty-two years ago from a heart attack, and mother died within two years of my father's passing from natural causes. I miss them every day and regret not having spent more time with them." Nancy takes a long pause and gulps down air.

"I am the last member of my nuclear family.[27] My brothers passed away, and both left behind children, whom I sometimes get to see on holidays. I do not have a close relationship with any of them as they all live in other states. Thus, I sometimes feel alone," she says with deep sorrow.

"Anyhow, I attended elementary school in my neighborhood. I was not the smartest kid in class, but I was not the dumbest either. I had a talent for art and music from an early age. Art was my favorite subject. I would draw different things on my school notebooks during class. After school, I would also spend my time drawing detailed leaves. My passion for art continued in high school," she says.

"In high school, I became a vegetarian. I also took various art classes every semester. In my senior year, I tried several psychedelic drugs and became very self-aware of my place in the universe. I will go into further detail in the next recording," she smiles.

"After high school, I applied to several art schools. I was accepted into Boston University and I attended only one semester. Strict learning environments were not suitable for me. By this time, I was living on my own with three roommates. I made paintings and sold them outside farmers markets. My paintings would not sell for much, but it paid the

[27] According to one study, about 1.2 million Americans over the age of 65 will have no living children, siblings, or spouses by 2020. These older adults without living biological relatives end their lives in isolation. For more information: National Aging Information Center, U.S. Administration on Aging, *Aging in the Twenty-First Century,* (Washington DC: Government Printing Office, 1996).

bills. I lived a very simple life—shopping at second-hand stores and growing my own produce in my backyard," she says proudly.

"I lived selling my painting for seven years. One day, I met my would-be husband, George Gavantti, in an art gallery. George was a college professor and a novice art collector. I was looking at a sculpture when he bumped into me, causing my drink to spill on my dress. The Italian man, with lovely black hair, olive skin, and brown eyes stood there apologetic. He quickly apologized and insisted on paying for the dress, and he gave me his business card. By the end of the night, he asked me to go on a date. I accepted, not sure why," she laughs.

"In three month we got married. We had a simple wedding with our families and friends. The first year was perfect. George wanted to have kids right away. I wanted to wait. We began to have problems over this issue. Eventually, we tried to have a child, but we were unable to. We visited several fertility doctors, but there was no answer. After a lot of money spent on fertility treatments, we gave up," Nancy says with a defeated voice.

"George started to come home late from work. I devoted more time to my art. We were living separate lives after seven years of marriage. Our marriage could not be saved. He moved out and left me a large sum of money in the settlement. I would later use this money to open my own art gallery," she says triumphantly.

> "This concludes today's recording. Thank you for listening," She says and the recording stops. The recording is automatically transcribed and tagged with hundreds of words, so it is easy to browse. As she continues to record more chapters, the website's program will stitch her life in chronological order.

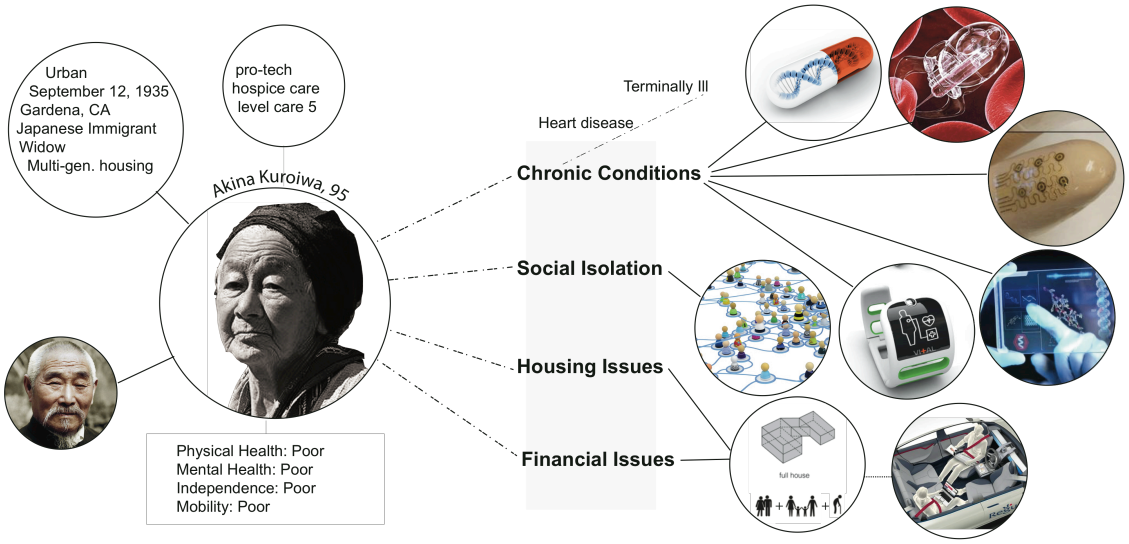
Nancy stands up from the desk. She needs to play the cello. Remembering sad parts of her life has brought her down. Nancy changes the living room space into a music stage, by moving furniture around. A comfortable chair faces the window. It is a beautiful night. She brings over the smart cello, the bow, her augmented reality spectacles, and a musical glove. Getting in a comfortable position, she puts on the glasses and the musical glove. She selects the normal level on the musical glove. The virtual reality spectacles magically transform the window into a concert hall. She is in the middle of the stage facing a crowd of cheerful fans. Nancy grabs the cello and the bow and starts to play. She closes her eyes and pours her soul into the music piece, "Bachianas Brasileiras No.4." With the help of the musical glove, she plays the piece perfectly. The glove sends electrical charges through her body to the brain, which allows her to move her fingers in precise manner. There is a setting to choose from novice to maestro. Although she is fairly young, her muscles do not allow her to play at a higher level than a three, which is at average level. Nancy continues to play the cello for thirty more minutes until she is exhausted. Nancy retires to bed. She walks to her room, and the central computer turns off the lights. Tomorrow would be a better day. As Nancy sleeps, Nina goes to her charging station, she will be fully charged in one hour. Nina, the robot cat, goes into sleep mode.

This story is about a theoretical life of Nancy, a 65-year-old living in the year 2030. She is the youngest of the older adults in the case study and barely old enough to receive partial benefits under the Elder Administration, see chapter 8 for details. If she were to live with the current social services and health care system, she would not be able to afford health care in the last years of her life. Due to her income and assets, she would be disqualified from receiving many services. However, as she does not have children or other family members to take care of her, she would also end up in a nursing home and die prematurely. Without the policy changes and technological advances proposed, she would not be able to age in place. The following and last case study examines the life of Akina, the oldest adult living the last days of her life.

CHAPTER 7: AKINA

PEACE IN HOSPTICE CARE

Chapter 7: Akina



Source: Guadalupe Aguilera Corona ©
See Appendix C for older adult tech comparisons and sources.

The last hypothetical older adult case study is of a 95-year-old, Japanese immigrant woman. In her youth, she was optimistic, hardworking, intelligent, intuitive, gentle, and practical. However, she is living the last days of her life in agony. She is bedridden in a hospice care facility. She has lived a long life and experienced the problems with the current social services for older adults. During her last years, she was able to use many of the elder benefits offered by the U.S. Department of Elder Affairs, such as loans and tax credits for her multi-generational house, reduced cost for home care, and adult day care. These benefits allowed her to age in place until she was institutionalized. The improved health care and social services significantly contributed to her long life. This case study demonstrates how policy changes and technology can help existing older adults deal with chronic illnesses, financial issues, and dying with dignity. The following story is the day in the life of this woman in the year 2030.

Lying in a comfortable double size bed, Akina sleeps soundly. Her bed faces a large full height window, which in turn faces a private courtyard. The courtyard is in full bloom; a variety of plants fill the space. Akina's family has placed a Buddhist altar or butsudan (仏壇), incense and candles in the courtyard.[28] The placement of an altar is a Buddhist tradition used near the death of a person to keep the unclean spirits out. Window shades that would typically keep the morning sunlight out are kept open all the time. Akina likes to look outside the courtyard day and night. She is bedridden and has been in the hospice for over a week. Next to her bed, her oldest male child, Andrew, sleeps on the sofa turned bed. It's 8:00 A.M. Akina slowly opens her eyes. The weight of the world rests upon her. Years of hardship have taken a toll on her.

Eleven months previously, Akina began self-recording her story for the American Ancestral project, the following is her introduction:

> "I was born on September 12, 1935 in the city of Nagano, the capital city of Nagano Prefecture, Japan. Raised during wartime, I had a simple life living in the mountain region with my family. The bombing of Hiroshima was a tragic event that marked us all. I was unable to attend university due to my parents' financial and safety concerns. I married fairly late, at the age of thirty, to Hachiro Kuroiwa, a low-level government employee for

[28] The Buddhist family altar is known as the butsudan, which is the center of family worship and devotional activities. The altar functions as a communication tool between this world and the afterlife. The majority of traditional Japanese people have an altar in their homes, which they worship a few days a week. For further information: Fabio Rambelli, "Home Buddhas: Historical Processes and Modes of Representing of the Sacred in the Japanese Buddhist Family Altar," *Japanese Religions* (35), 63-86.

the City of Nagano in 1965. Hachiro was five years my senior," Akina says slowly and weakly.

"We decided to migrate to the United States following Haricho's brother's success in California. California was the ideal place as many of our nationals settled in this region.[29] We arrived in Gardena and rented an apartment in a predominately Japanese neighborhood. Within two years of our arrival, we added a new family member, my son Andrew. He was such a cute baby," she says with a pleasant smile.

"Both Haricho and I worked in a Japanese restaurant owned by my brother-in-law. I worked as a cleaning lady and Haricho as a chef. We developed strong bonds within the tight Asian community and used our neighbors to take care of baby Andrew. Two years later, we had our daughter, Jade," says Akina.

"Education was a primary goal for the family. We had high expectations for our children. They had long study hours and limited free time. Andrew and Jade were placed in advanced classes in elementary school, and both played musical instruments. We attended a local Buddhist Temple and observed traditions each year. The children were bilingual, but fully assimilated into American culture. We were diligent with savings and managed to accumulate enough to send both children to

[29] The city of Gardena, CA has the highest percentage of Japanese people in the continental United States. Hawaii more cites with the highest percentages of Japanese people in the nation. Last modified May 1, 2015, http://zipatlas.com/us/city-comparison/percentage-japanese-population.htm.

college," she smiles as if the pain she was experiencing was a minor poke in the skin.

"Andrew," Akina said slowly, dragging each word. Andrew quickly opens his eyes, panic written on his face.

"Mom. Are you ok?"

"Andrew. Water," Akina said tiredly.

Andrew stands up, presses a button by Akina's bedside, and water is dispensed into a cup by a faucet on the wall. He hands over the glass to Akina, who sips the liquid through the straw embedded in the design of the cup. Once she drinks enough water, she places the cup on the nightstand. Meanwhile, Andrew makes her Chi tea mixed with warm milk on the small kitchenette in the room. Then, he hands over the tea so she can drink it at her own pace.

"Mom, Jade will be over in an hour with the grandkids," Andrew says.

Akina just nods. It is apparent that she is in pain, but she is putting up a brave front to cover the extent of her pain and suffering. Modern medicine can take away some of the physical pain, but other types of pain are incurable. Akina is at peace with death. Her husband died ten years ago, and she misses him. She is ready to die.

"Would you like me to read you a story, Mom? Or show you family pictures?" asks Andrew trying to find something to distract her.

"Pictures," Akina curtly says. Andrew clicks the button next to the wooden bed.

"Show recent family pictures. Display by family hierarchy," commands Andrew.

A screen comes up from a motorized lift at the foot of the bed. The window blinds automatically close. The pictures are displayed on the screen starting with pictures of Andrew. There is only one new picture of him and his wife, Yumiko. These pictures are taken from the recent posts on their social media accounts. Then, Jade's pictures come up. There are several pictures of Jade and her orchids. One picture shows a younger Jade and Akina smiling together, which were taken decades ago. The next pictures are of Yumiko, whose pictures show her cooking and playing with the pet bird. There is also a video of the gray cockatiel, which has a long red crown and yellow medium stripe, whistling a playful tune. Next come pictures of Andrew's kids, Ryan and Eric, who were in their early thirties. Many pictures show them with their young families. Next are pictures of Jade's only daughter, Mia. Mia is in her early teens, and most of her pictures are selfies—in the park, hospice, and multi-generational house.

A blue light sensor embedded on the wall opposite to Akina's bed starts blinking. This light notifies the presence of a visitor at the door. The doors of each room in the hospice are not locked, but the light is a formality.

"Come on in," Andrew says.

"Good morning, Mr. Kuroiwa. Akina, how are you today?" Says nurse Leila Johnson with a warm smile. She has taken care of Akina from the first day she arrived in hospice care. They have a great relationship based on mutual trust.

"Good," Akina replies with a weak smile.

"I'm here to check the swelling on your legs, ankles, and abdomen." Nurse Johnson places her hand on a wall pad, which instantly warms her hand. This prevents

the temperate discomfort felt when nurses and doctors use their cold hands. Slowly Nurse Johnson removes the sheet covers to check the areas of her body. She uses a device that compares images over a length of time to determine if a change has occurred.

"The swelling of the abdomen has increased by ten percent. Your ankles and legs are the same. Do you feel nauseous? Or light headed?"

"No," Says Akina.

"I am going to put a thin membrane on your abdomen to bring down the swelling. Meanwhile, have your son order you some food. I will also send a request to the kitchen staff to mix in medication with your food," says nurse Jonson as Akina nods. The nurse then applies an aloe membrane over Akina's abdomen. Then, she leaves the room.

"Andrew, please order me some food."

"What would you like, mom?"

"Rice. Miso soup. Fish and pickled vegetables."

"I placed the order. Do you need something else?" Andrew asks as he enters the request with his universal tablet, which is connected wirelessly to the hospice's mainframe computer.

"No. Thank you."

Andrew turns off the screen, and it goes down to the foot of the bed frame. The window shades automatically open. Using the buttons next to the bed, Akina presses the blue one to lift the bed into a sitting position. Then, Andrew goes to get water in a

separate plastic container; he used his fingers to moisten Akina's lips with water. This ritual is known as 'water of the last moment' and it is used for a dying person.[30]

Akina's self-recording for the ancestral website includes the following passage about her chronic condition and family living arrangements:

> "About a year ago, I was diagnosed with a terminal illness, heart failure. There were alternative treatments, but there was no guaranteed that any of them would work. My children wanted to try them all, but I strongly argued against any treatment," says Akina taking a short break.
>
> "I did not want the treatments, partly because of my religious beliefs, but mostly because I did not want to waste my children's savings. These treatments would only extend my life for a couple of months if not years. The proposed alternatives were not permanent solutions. My children eventually accepted my last wishes," she says nonchalantly.
>
> "They started to make plans for my final days. They wanted me to be comfortable and safe. Prior to the deadly diagnostic, I was living with Andrew and Yumiko, and his oldest son Ryan and his wife, Julie, in a multi-generational house.[31] This living arrangement was ideal for our traditional Japanese family," says Akina.

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[30] Japanese rituals and funerals are organized according to Buddhism. When a person is dying a ceremony called "water of the last moment" of "Matsugo-no-mizu" is performed, in which the lips of the dying person are moistened wit little bit of water. Last modified May 1, 2015, http://traditionscustoms.com/death-rites/japanese-funeral.

[31] Coresidence is preferred in Japan, as it is a form of long term-security. It also provides economic benefits by pooling financial recourses and sharing the cost of living. More info.: Akiko Hashimoto, "Cultural Meanings of 'Security' in Aging Policies," *Caring for the Elderly in Japan and the U.S.: Practices and Policies,* (London: Routledge, 2000), 20.

"Being the oldest son, Andrew and Yumiko were expected to take care of Haricho and me.[32] Andrew had to provide all our basic and health needs. Yumiko, who was also of Japanese descent, accepted the traditional responsibilities. She was a devoted caretaker and would take care of us like if she were treating her parents. In turn, Yumiko's parents were taken care by her eldest brother and wife." Akina takes a pause.

"Andrew and Yumiko were interested in multigenerational housing when Haricho and I retired from working at our Japanese restaurant. We passed on the restaurant's ownership to Andrew and he stills operates it. Meanwhile, Ryan was off to college to complete a degree in business administration. Ryan would work in different positions at the restaurant during school vacations. Unfortunately, at that time, multi-generation housing was not popular, and we could not obtain a decent loan," she says with a sour expression.

"Mom. Jade and Mia have arrived. They will be in shortly," says Andrew as matter-of-fact looking down at his wrist device. Jade and Mia had come two weeks ago from their home in Portland, Oregon when they found out of Akina's deteriorating health. They were staying in the living room of the Kuroiwa multi-generational house in order to save money and to strengthen their familial bonds.

[32] In the 'pure' Japanese traditional pattern, the father stays in charge until he hands over the ownership of the household or shop to his designated heir, typically the oldest son. In exchange, the son and his wife would care for the father and mother. The older adults them become dependent on the younger couple to provide all aspects of life. This old pattern has declined by 1960s and 1970s. For further information: Campbell, John C. "Changing Meaning of Frail Old People and the Japanese Welfare State." *Caring for the Elderly in Japan and the U.S.: Practices and Policies.* (London: Routledge, 2000), 85.

Jade and Mia arrived at the St. Luke Geriatric Hospital in California, which was one of the three specialized hospitals for older adults in the city. All geriatric hospitals have a hospice wing for the terminally ill, and continuum care. This particular hospital is arranged vertically, in a tower, with thirty floors. The lower five floors are used for the hospital rooms, labs, and doctor's offices. The next four floors up, which sum up to about forty-eight individual rooms, are reserved for hospice care (Appendix D). The rest of the upper floors are used for private residences in continuum care. There is also a basement with five levels of underground parking. The parking structure is home to an autonomous car rental company, which drives patients and guests in and out of the facility. Jade and Mia have used one of the cars to bring them to the hospital. In the elevator, Jade and Mia exit on the sixth floor. An attendant at the front desk greets them and grants them access to the Akina's room. The blue light on the wall blinks again.

"Come in," says Andrew.

"I have a lunch delivery for Akina," says a lanky man with black hair.

"Please leave the food on the tray table. Thank you," says Andrew.

"Let me know if you need anything else. Enjoy, Akina," says the kitchen worker.

"Thank you," says Akina very faintly and with a small smile.

"Ready to eat, mom?" Asks Andrew, and Akina just nods.

Andrew rolls the tray table closer to the bed. He hands her the gyroscopic fork, which allows her to move the fork at a constant movement regardless of her tremors.[33]

[33] A gyroscope is a device consisting of a spinning mass mounted on a gimbal so that its axis can run freely in one or more directions, thus maintaining its orientation regardless of any movements of the base. This idea can be combined with stabilizing technology to create tools for people suffering from tremors or other aging-related disability. There is a prototype spoon called Liftware, which is designed for people suffering from Parkinson's, and can cancel 70 percent of tremors. Last modified May 1, 2015, http://www.thefreedictionary.com/gyroscopic, and http://www.liftware.com.

Akina slowly eats her food. The Blue light blinks again. Jade opens the door, and they come inside.

"Mom. We are here," says Jade cheerfully.

"Hello, nana," says Mia. Akina, who had been chewing a slice of pickled cucumber, finishes the piece and hugs them gently.

"Hello," says Akina with a bright smile.

"Andrew, I can watch over mom," says Jade.

Andrew relinquishes the chair and handles a napkin over to Jade. Mia goes to sit on the bed by Akina's feet. Meanwhile, Andrew opens the door to the courtyard and goes to light up a candle by the altar. Jade continues to feed Akina.

"Nana. I saw a white rabbit outside of the house today," says Mia gleefully and Akina just smiles. "Ryan said he would come over with Cho later today." Continued Mia. "Eric is also coming to see you. He is at work right now," finishes Mia.

"Tell nana about your internship," says Jade to Mia.

"Nana, I received a message about my interview for the summer internship."

"I'm so proud of you, Mia," Akina says, pleased to hear this news.

"Thanks, nana," Mia replies with the biggest smile.

"No more," says Akina and Jade rolls the tray away.

"Nana, can I comb your hair?" Asks Mia. Akina just nods, and Mia proceeds to brush the thin white hairs gently.

Meanwhile, Jade uses her fingers to moisten the lips of Akina with water. Andrew takes the dirty dishes and utensils and begins to wash them in the small kitchenette. By

medical protocol, the dishes have to be sent back to the kitchen to be disinfected with UV light, but Andrew just wants to clear his head by doing something mundane. He uses this time to relax and stop thinking about his mother's conditions. He then places the cleaned dishes back into the tray, to be cleaned again by the kitchen personnel.

"I want to go outside," Akina says once Mia is done combing her hair.

"Of course mom," Andrew says and he lifts her onto the wheelchair and rolls her into the courtyard, in front of the altar.

Akina begins to pray in silence. Meanwhile, Jade and Mia light up candles and sit on a bench behind the altar. It was a warm sunny day and sunrays filtered to the open courtyard. A water feature on one of the corners of the courtyard creates sparkles & tuned droplets, with makes for a comforting background noise. There was a combination of interesting smells, the blooming flowers filled the space with sweet smells, and it mixed with the candle and incense burning. Akina is remembering her late husband, Haricho, and their early years together. Them working together in the restaurant, purchasing the restaurant from his brother, running the restaurant, buying their first homes, attending their children's college graduation, having their grandchildren, and retiring together. Haricho had been a good husband and father. A small tear escapes Akina's eyelids.

The following are Akina's tragic life circumstances that caused her to integrate with the Elder Affairs department's Tri-Net program:

"After retirement, Haricho and I were relatively healthy and active in the community. We kept a traditional Japanese diet, and we exercised daily.[34] A daily three-hour walk in the park kept us active for decades. Although retired in the eyes of the federal government, both Haricho and I continued to help out in the family restaurant. We were the unpaid help, and Andrew provided for all of our needs. We would help out in the restaurant about four to five days a week and use the days free to attend adult day care," says Akina and she laughs faintly.

"When I turned the age of sixty-two, around 2002, there were few services for senior citizens, such as Medicare and Social Security. We used Medicare to do routine check-ups three times per year. We saved our social security checks for future expenses. Most of our savings were used when Hachiro had a stroke. Medicare was able to cover some cost, but not everything. We did not have supplemental health insurance. The time he spent in the hospital amounted to an enormous medical bill. He was in the hospital for over a month due to complications. After recovery, Haricho was discharged, but he still needed physical therapy. Again, Medicare did not cover all costs. The saved money that we thought we would leave to our children was gone. Andrew continued working hard at the family restaurant to pay for more medical bills. Physical therapy improved Hachiro's movements and speech, but the damages were irreversible. Four

[34] The longest-living place on earth is in the Nagano prefecture, Japan. Life expectancy for its residents is 87.2 years for women and 80.9 years for men. The key to longer life span is their diet and exercise. Their traditional diet consists of white rice, pickled vegetables, miso soup, and seafood. Last modified May 1, 2015, http://www.aarp.org/health/healthy-living/info-2014/longevity-secrets-from-japan.html.

years later, Hachiro suffered a heart attack and died. I was devastated. A traditional Buddhist funeral ceremony was performed, and he was cremated," she says taking a long pause.

"Then, in 2025, Andrew took me to the local Elder Benefits office. The counselor, Amber Baker, invited us to her private office and explained the new benefits that I would be entitled to such as, adult day care, subsidized housing, and tax incentives. The new elder care legislation was a big improvement from previous benefits I received when I first retired. I agreed to sign up for adult day care," she says proudly.

"Andrew was very interested in the tax credits for multi-generational housing. He asked more question to Ms. Baker, and he made an appointment with a participating bank in the area, which would service the loan. Using the family resources, we were approved for the construction of the house. We also obtained two tax credits for twenty percent of the value of the house. The old house would be sold, and the proceeds will go to the new house. This newer house would also be equipped with aging technologies as this house was intended to last for several generations. Within six months, the house was constructed, and we moved in." Akina takes a moment to catch her breath.

"Our new house has three separate living quarters with shared amenities, like the dining room, kitchen, and family room. The building has a main entrance with a small courtyard that includes separate entries

for individual residences. The residence has two floors—the first level has my room and bathroom, and the shared amenities; and the upper level has the living quarters for Andrew and Yumiko, and Ryan and his future wife. Subsequently, future generations will rotate as we age and die," she pauses and wets her lips.

"The new house technologies monitored my health. My children received the results every day. I kept with the exercise routine after Hachiro's death. I also continue to help out in the restaurant for three days a week. Unfortunately, one morning instead of receiving normal results by text message, Andrew received a phone call from Dr. Rodriguez. My blood test showed an anomaly in the blood oxygen amount. Dr. Rodriguez immediately scheduled an appointment to the nearest geriatric clinic to have a CAT scan. The results were not good. My heart was failing. It was weak and could not pump enough blood. Dr. Rodriguez suggested possible treatments, but I refused. I was given months if not weeks to live," she says with a peaceful and content face.

The blue light blinks again.

"Hello, It's Leila. I'm coming in," announced the nurse.

"Hello," Andrew said as he rolled Akina back to the room.

"How are you doing Akina?"

"Good," says Akina.

"Do you have any discomforts?"

"No."

"I'm going to check your pulse. Your pulse is fluctuating." Nurse Johnson used a non- invasive device that showed results instantly.

"Your pulse is slower than normal. Do you have chest pains?"

"Yes."

"I'm going to increase your morphine dosage. Is that ok with you?"

"Yes," as she said those words, an infuser injects more morphine directly into the arm of the fragile patient. She had been connected to a morphine IV since her first day at the hospice.

"Akina, I fear your life is coming to an end," she says putting her warm hand on Akina's shoulder. "What else do you need?"

"Nothing."

"Try to relax. I will come back in an hour, else send me an alert." Nurse Johnson left the room.

The change in pulse and blood pressure was a warning sign of the Akina's impending death. Andrew and Jade were aware of this information. Akina also felt her time was coming to an end. However, she was in peace with a serene face. Her children were here, and she could not have asked for anything better. Jade dipped her hands in the water bowl and moistened the lips of Akina one more time. Andrew used this time to contact the rest of the family members. This was an emergency, and they needed to be here.

In less than an hour, the family restaurant closed its doors for the rest of the day. Yumiko, Ryan, Cho, and Eric were in the hospice room with the rest of the family. Akina asked to be taken outside one last time. The family follows behind her to the small courtyard with the altar. They stand on of her sides. They take turns talking to her and then staying quiet.

Half an hour later, nurse Johnson comes back to the room. She has been wirelessly monitoring Akina's vital signs, and they are very faint. Nurse Johnson is aware of the graveness of the situation, but she needs to be there for medical and moral support. This was not her first patient. She stayed with the family members, watching from afar, but ready to intervene. Akina deserved to die with dignity and with the love of her family. Based on the medical research, Akina's heart was near its end, and She felt sad for Akina knowing how painful it would be.

"Akina, I am going to administer more morphine." Said nurse Johnson as she pushed the button to lessen the pain in her chest. Akina was relieved, and it could be seen in her eyes.

As the sunset was setting over the orange and purple sky, Akina took her last breath. She was holding Andrew and Jade's hands with each of her hands. Instantly, the limp body released the hand of her children. Everyone was crying, including nurse Johnson, who tried to keep composed. Nurse Johnson checked for a pulse and did not obtain one. Akina was dead. Andrew closed her mother's eyes, and Jade moistened her

lips one last time. A white paper was placed over the altar to keep the unclean spirits away.[35]

This story is about a theoretical life of Akina, a 95-year-old dying in the year 2030. She is the oldest of the older adults in the case studies and has experienced the current elder support services. Without the policy changes and technology, she would not be able to age in place and die with dignity. She did not have enough financial resources to pay her medical bills or home care services. In addition, her life would have been shorted if she had been institutionalized for not being able to live in her multi-generational home. The following chapter proposes policy changes that should begin to be crafted today in order to achieve the future scenarios depicted in this case studies.

[35] Japanese rituals and funerals are organized according to Buddhism. When a person dies the family shire or altar is closed and covered with a piece of white paper, called Kamidana-fuji. This is done to keep out the impure spirits of death. Then, the body of the deceased in put on a table with some flowers, incense and a candle. Some families decide to put a knife on the chest of the deceased to defend her or him form the evil spirits. Lastly, the body of the deceased is also washed. Last modified May 1, 2015, http://traditionscustoms.com/death-rites/japanese-funeral.

CHAPTER 8: 2030 COMMITMENT

POLICY AND PRACTICE

Chapter 8: 2030 Commitment

Where would the United States be if the government had not invested in the railroads, rural electricity, the land grant universities, and research and development for the Internet? Without these infrastructures an numerous other policies, the U.S. would not be the power that it is today, nor would average Americans enjoy the fruits of technology in their everyday lives (Poo 143). As Ai-Jen Poo says, "Over and over again, at key turning points, we have invested in the infrastructure needed to thrive as a nation and to lead the safe, productive, and fulfilling lives that as individual Americans we expect to live" (143). The word infrastructure refers to "…long-lived assets that provide a backbone for other production and consumption activities in the economy" (Edwards). An infrastructure of continuum care, or the Tri-Net, is the solution to the impending aging crisis of 2030 and beyond. Parts of the continuum care infrastructure are embedded in the case studies and parts are exiting aging related programs at the Administration on Aging (AOA). The invisible backbone of this infrastructure provides housing, health care and home care, and social services for the older adults.

The policy proposed in this chapter tackles the major issues affecting the future older adults that were described in chapter 2. These include housing, aging disability, financial problems, health care, and homecare. The Tri-Net combines housing, health care, and social services along with technology to provide supporting services to the older adults. Currently, there are several housing, health-related, and social service federal programs available to older adults and impoverished populations, however they are separate and limited in their scope and vision of the future (Poo 36). Investing in a

comprehensive social network will be expensive to set up, but "we will be making a lasting investment that pays off with the benefits for generations to come, as evidenced by the success of the universal social insurance programs in Japan and Germany" (Poo 160). As previously stated, the programs for older adults are in existence, but they need to be streamlined and combined into one department.

The elder boom is behind the larger elder populations of Japan and Germany, who had to pass social and political policies to deal with the demographic shift. As Ai-Jen Poo described the changes made:

> It was in 1997 when Japan passed that threshold, and in 1994 when Germany did; in both countries this demographic turning point resulted in legislation establishing universal long-term care insurance programs. Germany began implementing its program in 1995 and Japan in 2000, and both evaluated and made subsequent revisions and adjustments to the programs…
>
> Both countries wound up adopting universal social insurance programs to provide long-term care, in which eligibility is based on functional need, not on income, assets, or the ability of family caregivers. (Poo 151-152)

As depicted in the 2030 case studies, technology is a major part of the lives of the hypothetical older adults. Unlike preceding generations, Baby Boomers have come to embrace technology. They have adapted to computers, smartphones, social media, etc. (Rogers). Most Baby Boomers will continue to use newer technologies, and with the help

from younger family members and friends, they can age in place. Technology can grant them independence, expand their longevity, monitor their health, and reduce social isolation. With the social acceptance of technology in place and further governmental oversight over Big Data, the advances that technology can offer to the elder aging populations are limitless.

Over the next twenty years, the number of people 65 or older will increase from 40 million to 70 million with the aging of the Baby Boomer generation (Grayson and Velkoff 1). Of this number, 70 percent will have at least one chronic illness, and will need long-term services and support (Fernald 15). These older adults will have difficulties affording retirement, as they have fewer savings, are living longer, and the cost of living is rising (Poo 33). There is an urgent need for a comprehensive federal policy. This thesis proposes the Tri-Net policy to deal with this aging crisis. Currently, housing, health care, and social services have separate federal administrations. The United States does not have one central department dedicated to older adults to act as an umbrella for other federal programs, organizations, and state and local offices. To develop a continuum care infrastructure, I propose that this model serves as a catalyst to build on existing aging related programs from the AOA, HUD, and HHS, and to create a new executive department for Elder Affairs with cabinet-level status. This is similar to how the formerly independent agency of Veterans Administration was made into the United States Department of Veterans Affairs for military veteran benefits in the 1930s ("History"). Thus, the Administration on Aging should become Elder Affairs with additional resources, and it should include the following policies.

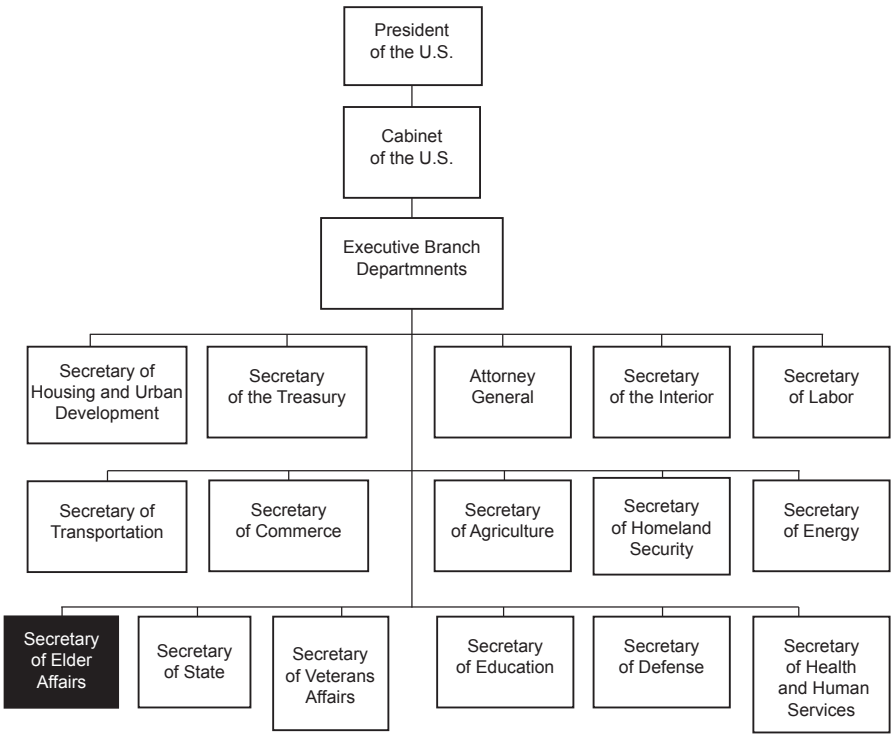
The Elder Affairs executive department would be headed by the Secretary of Elder Affairs, which would be appointed by the President with the consent of the Senate. This department would have three Administrations—the Elder Housing Administration, Elder Health Administration, and Elder Benefits Administration (Figure 10). The Elder Housing Administration would be responsible for providing smart, affordable housing, guaranteed multi-generational home loans, home assessments, and smart home tax credits. This new administration would do many of the services the U.S. Department of Housing and Urban Development currently provides for older adults, such as reverse mortgages, housing counseling, and rural housing loans (HUD).

The second part of the network is the Elder Health Administration, which is responsible for providing comprehensive health care, geriatric scholarships, education and training for elder caregivers, biomedical research, geriatric medical hospitals, geriatric community clinics, and health-related technologies. This new Administration includes many of the services provided by U.S. Health and Human Services, such as extending affordable coverage to older adults, emphasizing primary and preventative care, reducing growth of health care costs, improving health by use of meaningful information technology, and advancing scientific knowledge and innovation (HHS).

Lastly, the Elder Benefits Administration is responsible for initial registration, eligibility determination, adult day care, partial coverage of caregivers, respite for family caregivers, counseling, and other key benefits and entitlements. The Administration on Aging offers many of the services listed under the new Elder Benefits Administration, such as supportive and caregiver services, nutrition and health promotion programs, long-term care programs, and community aging networks (AOA). The following are three

policy categories of the continuum care infrastructure—housing, health care, and home care—that need to be addressed by the federal government in order to support older Americans to age in place, and live with dignity for the rest of their lives.

Figure 10 Proposed U.S. Branch Executive Department



Source: Guadalupe Aguilera Corona ©

Housing Policy

Owning a debt free house at the time of retirement makes a significant difference in the type and quality of services that individuals can afford. Homeowners can pay for higher quality services, such as institutionalized care and home care, than renters (Fernald 14). There is a disproportionate amount of renters to homeowners, aged 65 and over, especially for African-American and Latino populations (8). Most Baby Boomers have

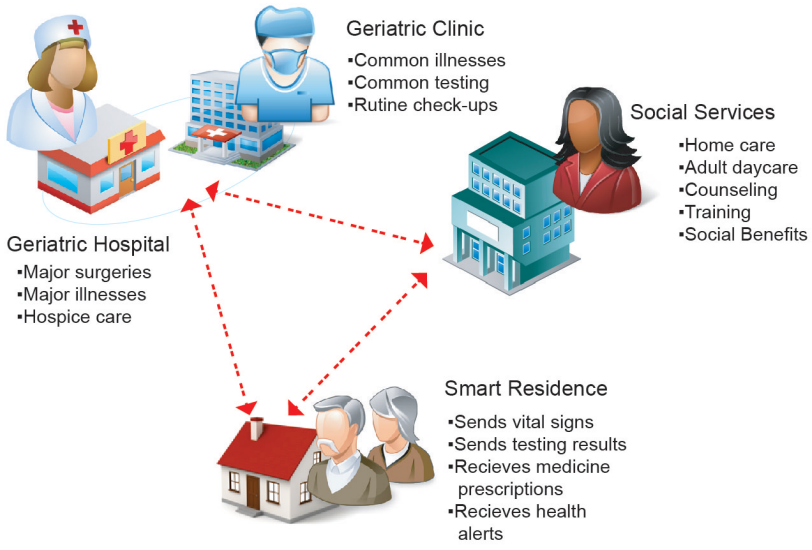
savings and assets that will be insufficient for retirement, as longevity and the costs of retirement keep increasing. Homeowners who own their homes debt-free can take a reverse mortgage, or other financial alternatives, which provides a monthly allowance for a specified amount of time. But, even if the older adults own their homes debt-free, they will continue to pay for land taxes, repairs, bills, etc.

Also, according to AARP, Social Security is "the principal source of income for nearly two-thirds of older American households, and roughly one-third of those households depends on Social Security for nearly all their income" (LeaMond). The current Social Security benefit averages $14,000 per year, but this number will decrease by 2030 (Goss). Thus, it is imperative that the Tri-Net policy deliver an infrastructure of continuum care that provides affordable and accessible smart housing for all older adults, and not just for those who cannot afford it.

The first part of the Tri-Net policy is housing, which falls under the Elder Housing Administration (Figure 11). This administration is responsible for all issues related to smart housing for older adults, such as home assessment, smart house design templates, smart home technology tax credits, home upgrade credits, and multi-generational housing loan guarantees. The primary goal of this administration is to provide services and affordable housing options in order to allow older adults to integrate with the Tri-Net. In the Tri-Net, each dwelling is wirelessly connected to a geriatric clinic, geriatric hospital, and senior center (Figure 11). The older adult is at the center of the integrated system, in which the social services work together to provide optimal housing, health care, and home care.

Under this program, each state would be responsible for managing its aging offices and resources, like the current Administration on Aging has an Aging office in each state (AOA). Each state will subdivide its land into regions for optimal efficiency. The regions will be divided after land designation—rural, suburban, and urban. The goal is to spread health care providers proportionally to population density. Thus, older adults living in rural areas will have equal access to quality health care as urban elders. Each of the land designations will then have a prescribed radius—urban radius is 10 miles, suburban radius is 25 miles, and rural radius is 100 miles—in which a geriatric hospital serves a specific segment of the older adults. Within each radius, each individual residence will be connected wirelessly to a network that includes a senior center, clinic, and hospital. The distance of the radius is appropriate for each land designation, as the smaller radius corresponds to denser population centers in cities, in which more geriatric hospitals are needed. Older adults living in smaller rural towns are part of larger radii and would share access to the nearest geriatric hospital, which would also serve a more densely populated area. For instance, in the first care study, Linda Linder lives in rural South Dakota, and she belongs to the Sioux Falls Geriatric Hospital Network, which falls under the 100-mile radius (Figure 12). The goal is for each smart dwelling to be connected wirelessly to a geriatric hospital, which has specialized and trained physicians for older adults.

Figure 11 Tri-Net



Source: Guadalupe Aguilera Corona ©

One of the responsibilities of the Elder Housing Administration is to provide a home assessment for qualifying older adults. This is similar to HUD's housing counseling agencies that provide advice on buying a house, renting, etc. (HUD). First, the older adult would come to his or her local Elder Benefits Office to apply for housing benefits. If the older adult is physically unable to meet in person, he or she can schedule a home visit with a social worker. Then, the social worker would conduct an assessment at the time of visit and explain the housing benefits available for a specific person. The social worker will also explain the housing models, the advantages and disadvantages, and financial resources available for each type. The older adult will then decide which option is best for his or her own lifestyle. It is advisable that every older adult in the U.S. connect to the Tri-Net.

As depicted in the case studies, there are several models of housing that are connected wirelessly—upgraded existing semi-smart homes, smart houses, smart multi-

generational housing, smart institutionalized rooms, and smart or semi-smart continuum care residences. Each option has advantages and disadvantages, but it ultimately depends on the budget and requirements of older adults. For instance, if the older adult owns a home or lives with family members, but he or she does not have enough savings, then it is best to retrofit his or her house into an upgraded existing semi-smart home. The advantage of this option is the technological upgrades will connect to the Tri-Net. In order to wirelessly connect to the Tri-Net, the home needs three main devices—decentralized computer, sensors, and cameras. However, the disadvantage of this home is that it will continue to consume energy and generate other expenses.

In the second case study, Juan Garcia lives in an upgraded home. This is Juan's experience:

> Once I was living with Michael permanently, we decided to upgrade the house. I applied for elder housing benefits at the Lewisville Elder Benefit Office. The social worker, Maria Hernandez, explained the different housing options and benefits available to me. After expressing my desire to live with my son, Ms. Hernandez provided us with a list of the tax credits available to remodel the home. She briefly explained the benefits of upgrading the home and connecting it to the Texas Tri-Net. I was skeptical about the information, as I was never one for technology. Allowing a third party to have easy access to my personal information at home did not sit well with me. I did not understand the usefulness of "Big

> Data". Seeing my hesitation, Ms. Hernandez made a follow-up appointment.
>
> Prior to the meeting, the family gathered at Michael's house, and we discussed the idea of a smart house. We all agreed it was better to upgrade the home. Then, at the Elder Benefits Office, Ms. Hernandez went over the tax credits that could be used to purchase the house technology. She gave us a list of providers and other product information. And that is how our house became smart. It was one of the best decisions I ever made. (Chapter 5)

The financial resource available for upgrading an existing home would be a tax credit to cover the cost of technological home devices, like programs by HUD. The tax credit for the primary residence of a retiring individual would be up to $17,000, which accounts for the rate of inflation of 3.4 by 2030; it would be $5000 today ("United States"). The tax credit can be used during different tax seasons, up to the maximum allowance, for the life of an individual 67 and older. The tax credit includes the cost of the products and installation, which is sold and installed by approved vendors. The vendors have a separate tax incentive, which reduces the cost of installation. In the event that a senior citizen needs to move to a different residence, there are two options available. The older adult can have the technology removed and installed at the new residence at a low fee. Through the federal housing program, vendors have a re-installation policy to charge a minimal fee for older adults. The second option is for the older adult to sell the equipment to the new tenant and use the proceeds to purchase new

equipment. In addition, the technology devices are of high quality and made to last, so they don't become obsolete within a couple of years.

The second housing type is a smart house. Technologies for smart homes can significantly help older adults "who are beginning to develop functional and cognitive limitations but wish to remain in their homes" ("The New Era 8). The house can monitor activities of daily living and alert third parties if the activities are out of sync with established patterns. If an older adult has the financial means and wants to invest in a home for the long-term, he or she can construct a new smart home. A newer smart home is carbon positive, which means that it produces more energy than it consumes (Pipkorn). Thus, the extra energy is sold back to the grid, to the power utility. This extra income can then be used to pay other expenses. The smart house also comes with embedded sensors in walls, floor, and ceiling, and smart appliances, which connect to the house's brain—the central computer, which manages the intelligent functions in the home.

In the first case study, Linda Linder lives in a smart house in South Dakota, and the following is her experience:

> One of the greatest benefits of having a new smart home was that it allowed me to be part of the Sioux Falls geriatric network. As you might know, the function of this network is for the constant monitoring of one's health. On the day we applied for the elder housing benefits, James Jr. sat next to me at the local Elder Benefits Office. I told the social worker, Mrs. Dolores Dean that I wanted to construct a new smart house. Mrs. Dean provided me with a list of approved general contractors. She briefly

> explained how the smart home worked, and then she signed up for a seminar on smart housing technology. This class taught me how to control the new home.
>
> In the following months, James Jr. and I had selected a contractor, a fellow by the name Bob Rockton. Mr. Rockton was the head of a small contracting firm that specializes in smart homes. Mr. Rockton said that he had taken an intensive course and passed a standardized test to obtain his smart house certification. This certification allowed him to work directly with retiring Americans looking to switch to new smart homes or to upgrade existing homes. He also provided us with several pre-designed house models available at the Elder Housing website. The house plans were free of charge, and the owner can customize each for individual preferences through a user-friendly website. With the help from my children and grandchildren, I designed my new home. (Chapter 4)

Financial resources available for the construction of smart homes would also be tax credits and reverse mortgages. The older adult would claim the tax credit on his or her taxes, unless the older adult has a dependent status, in which case the head of household claims it. The tax credit for the construction of the primary residence of a retiring individual is 20 percent. The tax credit can only be used once during the lifetime of a person 67 and older. The second financial resource is a guaranteed reverse mortgage for the older adult's existing home (HUD). This program allows individuals to withdraw equity from his or her home and use it to finance the new smart house. The local Elder

Benefits Office provides the older adults a list of local banks and brokers, who assess the value of the house to determine the amount they can receive.

A third housing type is the smart multi-generational housing, which is a dwelling in which more than two familial generations live together. This house type is ideal for younger families who want to take care of elder family members in the same household. This housing type combines the smart technologies with family shared resources to lower housing cost for all family residents. The multi-generational housing will have fully integrated smart technologies; thus, it will be carbon positive. Families can choose to have a house for two generation or three generations and this will affect the amount of tax credits they can receive.

In the last case study, Akina Kuroiwa lived in a multi-generation housing with three generations of her family, and the following is her experience:

> Haricho and I were living with Andrew and Yumiko, and his oldest son Ryan and his wife, Julie, in a multi-generational house. This living arrangement was ideal for our traditional Japanese family. Being the oldest son, Andrew was expected to take care of both us. He provided with all our basic and health needs. His wife, Yumiko was a devoted caretaker and would take care of us like if she were treating her parents. Andrew and Yumiko had invested in the new multigenerational housing prototypes when Haricho retired from working at our Japanese restaurant.

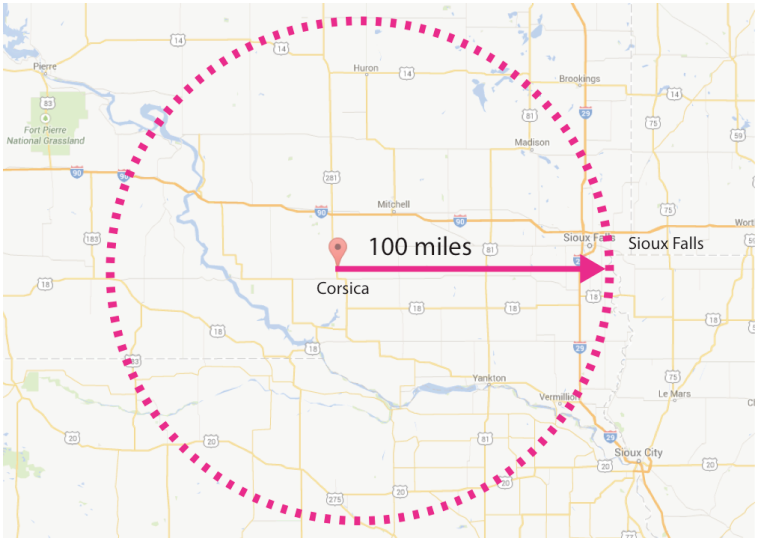
> Our house has three separate living quarters with shared amenities—dining room, kitchen, and family room. The building has a main entrance with a small courtyard that includes separate entries for individual families. The residence has two floors, the first level of the aging parents, Harichio and I, and the shared amenities. The upper level has the living quarters for Andrew and Yumiko, and Ryan and his future wife and children. The house also includes newer technologies that connect to the Boston Tri-Net. We received a tax credit for the construction of the new multigenerational housing, as part of the initiative to allow family members to take care of aging parents in the same household.

Financial resources for multi-generation housing would be house loans and tax credits. Under the Elder House Administration, loans for multi-generations housing are guaranteed. Participating banks and other financial institutions provide the loans to qualifying older adults and their families. The second economic resource would be the tax credits. In this case, a 20 percent income tax credit would be given to houses for three generations, and a 10 percent income tax credit for houses with two generations. The guidelines for obtaining the tax credit would be based on requirements given by the approved banks. Families can combine both financial resources to construct their new smart home.

The fourth and last housing type is a combination of the continuum and institutionalized care. In these housing types, the older adults rent a room or individual home from a landlord or care facility. Under the Elder Affairs department, the law will

require landlords or facilities renting to older adults to include the connection to the Tri-Net. The landlord or facility can choose to upgrade and include the connection technologies—computer, sensors, and cameras—or they can build brand new smart buildings. Existing nursing homes, continuing care, and similar housing for elder adults can obtain the tax credit to upgrade the rooms. The landlord or facility owner needs to visit their local Elder Housing Office to get approved for the tax credits. They also need an approval to be able to purchase and install the devices from official vendors at a lower cost. Financial incentives for investors and developers are one of the most efficient methods for the construction of new smart houses and facilities. Several tax breaks and credits should be given to developers in order to build environmentally sustainable and affordable smart housing. Similarly to the smart homes tax credits, developers would receive a 20 percent tax credit to build new smart facilities for older adults. They could also use a depreciation of 27.5 years on their Pro-forma. All these incentives will allow other older adult renters to be connected to the Tri-Net.

Figure 12 Rural Tri-Net, Corsica, South Dakota



Source: Guadalupe Aguilera Corona ©

Health Care Policy

As U.S. residents age and retire, they primarily stay in proximity to where they currently reside (Maciag). About nine percent move to a different city or out of state (Maciag). In general, the elderly are distributed geographically in proportion to the population ("A Profile" 6). Older adults continue to stay in their homes until they are unable to care for themselves (Farber et al. v). They want to live in their homes and communities, and independently, for as long as possible. Nearly half of households aged 50 and older makes their homes in the suburbs and surrounding metropolitan areas, and the remaining half are evenly divided between core cities and rural communities ("A Profile" 6). Unfortunately, older adults that live in rural areas have difficulties accessing health services, which are concentrated in central places (Goins, et al. 208). The central issue accessing health services is the disconnection between health providers and recipients, which is worst in rural areas. It is crucial that every older adult regardless of where they live receive access to affordable and high-quality health care.

In addition to the inadequate access to health services in rural areas, there is a shortage of medical doctors specializing in older adults, trained professionals, and gerontological resources (AGS). Currently, there is a critical shortage of registered nurses and geriatricians in the United States (Poo 37). According to the Geriatric Society, there are about 9,000 M.D. Geriatricians and around 2,400 geriatric psychiatrists (AGS). The Institute of Medicine estimates that by 2030, about 36,000 geriatricians will be required, but the current projection does not meet this number (IOM 19). In 2013, the ratio of geriatricians to older adults was 1: 870, but an adequate ratio should be 1:300 and this

will only worsen by 2030 (Brittain). In addition, only 3 of the top 145 American medical schools have a full geriatric department, and less than 3 percent of students take a course in geriatrics ("Medical" 8). Adequate numbers of geriatricians are necessary for the upcoming wave of aging Baby Boomers.

Similarly, another challenge of the health care system is the limited geriatric training provided for the workforce. Several health-related studies show that older patients' health improved when the providers were trained in geriatrics (Kovner et al. 78-89). Due to the shortage of primary care providers, older patients will likely end up in emergency rooms, which consume about a quarter of Medicare's budget (Rauch). This inappropriate use of Medicare funds is adding to the already high-cost devoted to older adults. In general, there is little training in caring for older adults, and there are no federal requirements for those who care for the elderly (IOM 22). It is imperative that individuals caring for older adults are adequately trained.

To deal with these health care issues, the second part of the Tri-Net, which falls under the Elder Health Administration, includes the following polices. The Elder Health Administration is responsible for providing comprehensive health care, geriatric medical hospitals, geriatric community clinics, geriatric scholarships, biomedical research, and health-related technologies (Figure 14). Again several of the goals and programs are in place under the U.S. Health and Human Services, but the prosed policy will take their organization and specialize it under one program for older adults. The primarily objective of this new administration is to provide remote access to health services in order to allow older adults to integrate with the Tri-Net. In the Tri-Net, older adults are connected

wirelessly to a geriatric clinic and geriatric hospital, and health-related technologies that monitor their health and prevent diseases (Figure 11). In this model, the older adult is at the center of the integrated system, as it empowers him or her to manage their health, stay connected to their communities, and remain independent in his or her home ("The New Era" 2).

First, the federal government needs to provide universal social insurance programs to provide health care and long-term care, like Japan and Germany (Poo 151). Since the United States is much larger and more varied in land size and population demographics, the health care system must be particularized. In order for older adults living in rural areas to have access to health services without moving to metropolitan areas, the healthcare system must decentralize primary care. The health care system needs to move towards a regional approach, such as Canada's health care system (Thomson et al. 19). The Canadian health care system is divided into ten, mostly autonomous, provincial health care systems that report to their provincial governments (19). The individual provinces have a variation of funding and coverage. Within the Canadian "single-payer" health care system, every Canadian citizen is covered by the national healthcare system, which includes coverage for mental health services (19). In the Tri-Net, subdividing each state into rural, suburban, and urban areas, and connecting a geriatric hospital to individual homes within a prescribed radius would solve these issues.

Second, the Elder Health Administration is responsible for providing adequate Geriatric Medical Hospitals at strategic locations. These geriatric hospitals have a specified range for patients living in different land designations—rural, suburban, and

urban. The hospitals are mostly located in city centers where the population density is greater than rural areas. The geriatric hospitals' people above the age of 65 are staffed by geriatricians, geriatric psychiatrists, and registered nurses. However, the specialized hospitals treat life-threatening illnesses, uncommon cases, or surgeries. The purpose of the geriatric hospital is to house the limited number of geriatricians in a central location to provide specialized care for chronic conditions. The specialized hospitals decrease the Medicare payments for expensive and most of the time mistaken trips to the emergency room (Rauch). The Tri-Net will allow geriatricians to treat a greater number of older adults without having to be physically there to review their health information. The individual health information will be sent to the doctor wirelessly by the smart home health technologies. For common illnesses, routine check-ups, and other standard medical treatments, the older adults go to their local Geriatric Clinics. In addition, these hospitals have a separate unit for hospice care. In the fourth case study, Akina is at a hospice room in Boston Geriatric Medical Hospital. There, she can get the appropriate medical care to live her last days with dignity.

Third, the Elder Health Administration funds Geriatric Community Clinics. The clinics' size vary by population density and each state decides how many and where they are located. In the Tri-Net, the clinics are connected wirelessly to individual homes' geriatric hospitals. The patients use health-related technology, which sends their health information over the Internet to the specialized clinics and hospitals. Both the clinic medical personnel, such as Medical Doctors, Nurse Practitioner, and Registered Nurses, and the geriatrician of the individual older adult receive the health information. The local

clinic deals with the daily check-ups and prescriptions; the geriatrician, who is located in the geriatric hospital, gets involved if there is a critical health concern.

In the second case study, Juan Garcia, who lives in Lewisville and is part of the Dallas Geriatric Hospital Network, has a chronic condition that requires daily monitoring. He uses two types of devices to run diagnostics and send the information to the health providers. Juan's personal health data is sent over to both the clinic and the hospital. He receives the results in minutes and the appropriate course of action. The local clinics take care of normal results, and they also deal with prescriptions. If the results are critical, then the geriatrician contacts the older patient directly to recommend a course of action. When Juan's lung test came back, it showed a mass increasing in size, and his geriatrician contacted his son to recommend a lung transplant. In general, when Juan is sick or needs specialized testing, he goes to the local clinic, and if the treatment requires more specialized treatment, then he goes to visit the geriatric hospital. Thus, Juan can access quality health services without having to spend much time and money.

The monitoring devices are some of the health-related technologies used in the year 2030 case studies. The problem with current health-related technologies is the emphasis on tele-health and telemedicine, which are costly to scale in deployment and individual pieces rather than being connected to other devices ("The New Era" 3). The Tri-Net uses internet-based devices to connect the three parts of the infrastructure. The health-related devices monitor and manage an older adult's chronic conditions, and they help to maintain his or her wellness and mental health as they age (4). The different sensors, monitoring devices, medication dispensers, and smart toilets collect data about

the older adult's vital signs and run diagnostics without having to go to their health providers. The data collected is then analyzed through computer algorithms to detect patterns and trends, and alert the medical providers if a change occurs. In order to provide older adults with the health-related technology needed, the Elder Health Administration provides generic, low-cost monitoring devices for low-income individuals. These devices are made by third party companies, which have government contracts and can mass-produce generic devices cheaply. The higher quality brand devices are available for consumer purchase but are not covered by this program. As discussed in the previous section, the Elder Housing Administration provides the infrastructure to connect wirelessly to the Tri-Net.

Lastly, the Elder Health Administration provides geriatric scholarships, and biomedical research in order to increase the numbers of trained professionals and higher quality of care, like HHS and other governmental organizations that invest in health education (HHS). In order to attract students to the specialization in geriatrics, more scholarships and financial incentives must be provided. As stated in chapter 2, the main reason students do not specialize in geriatrics is the lower salaries in comparison to other specialties. Thus, an increase in older adults will generate demand for this specialization, and the wages will increase. This administration will devote resources to creating a national scholarship, fellowship, and grant programs for age-related majors or areas of study. The administration will also require each state to provide scholarship money for age-related care to their state universities. Also, part of the national scholarship plan will include a state-run program in which tuition is paid in exchange for five years of services at an underserved community in rural towns or cities (Brand). The fellowship and grant

programs will be awarded to those individuals focusing on biomedical and technological research. This investment in research and technology will improve the preventative care of older adults, and decrease the high costs of Medicare that are used in the last years of the life of an individual (Rauch).

Figure 13 Continuum Care Levels

Source: Guadalupe Aguilera Corona ©
This chart depicts the spectrum of continuum care levels with the three variables: health, income, and housing. The hypothetical characters are plotted in the spectrum according to their health, economic resources, and house type.

Social Services Policy

As older Americans age and retire, they want to live independently for as long as they are physically and mentally able to do so. An older adult might live alone or with a spouse, but with time even the most independent person might need help around the house or with the activities of daily living, such as bathing and toileting ("The New Era" 4). Older adults that are taken care of by family members might also need help, as the younger members have day jobs and are unable to take care of them during those hours. Unfortunately, home care is expensive, and federal social programs do not cover its cost. There are a few states, such as California, that cover part of the cost for caregivers ("Caregiver"). In California, families can hire and fire the caregivers at their discretion, which allows young family members to work outside the home and earn wages and benefits. Thus, the continuum care infrastructure should allocate funds to individual states to cover payments for caregivers.

By 2030, there will be a shortage of professional caregivers, as the informal family caregivers cannot meet all the needs of the baby boomer population (Poo 71). At least 70 percent of older adults over the age of 65 have at least one chronic illness, but "the population of professional and informal caregivers is declining, especially in relation to the potential demand for care and support" ("The New Era" 2). More professional caregivers are needed, as older adults wish to remain independent and age in their homes. However, working conditions combined with low wages and long hours has led to a high turnover in this industry (89). Also, few of them "receive paid vacation or sick days, despite the high rate of injury and burnout associated with care work" (90). Professional

caregivers face, "…high rates of depression from isolation, separation from their families, stress, and fatigue" (91). Caregivers hired through an agency tend to have more rights and work fewer hours than the independent caregivers (91). The majorities of caregivers are employed independently, and often are immigrants (93). Furthermore, most caregivers do not have formal training in caring for older adults, which might prevent them from delivering a higher quality of care (IOM 22). Caregivers are essential to the health care system, as they potentially cut healthcare costs by managing chronic illnesses instead of sending older adults to expensive institutions.

The third part of the Tri-Net policy is social services, which is part of the Elder Benefits Administration. Most of the organization for this administration is derived from the existing programs of the Administration on Aging. The new Elder Benefits Administration would be responsible for the initial registration of older adults, eligibility determination, adult day care, partial coverage of caregivers, respite for family caregivers, counseling, and other key benefits and entitlements. The purpose of the Elder Benefits Administration is to expand on the supportive services currently available for older adults through technology in order to deliver the best social service system required to age safely in their homes. In the Tri-Net, social services, health care and housing are integrated and connected to prevent injuries, social isolation, and chronic illnesses (Figure 11). This can be seen, as a "team of professionals coming together to assess the older adult's medical and health needs in order to develop an integrated plan, and then to provide all the required services" (Poo 158). This holistic approach allows all providers to develop preventative strategies and services, such as "frequent checkups, monitoring, and diet and exercise programs, which wind up costing less than diagnostic care" (158).

To successfully age in place "is more than just about health—it is about empowering and supporting the whole person through telecommunications and Internet-based technologies" ("The New Era" 3). Thus, the Elder Benefits Administration provides social connections to friends, family, and community organizations by providing a social service system that allows them to manage their disease and functional limitations.

The first responsibility of the Elder Benefits Administration is for the initial registration and eligibility of older adults. Older adults will be eligible to apply for these social services at the age of 67, using Social Security's full-benefit retirement age of 2030 (NASI). Older adults can register for retirement benefits early at the age of 65. They need to visit their local Elder Benefits Office, to meet with a social worker and apply for all the social services available, including smart housing from the Elder Housing Administration. The forms are digitalized and available on the Elder Benefits' Website, but the offices have the human personnel to humanize the process. There is one universal form that older adults need to fill out, and that form is sent over to the other three administrations. The process is fast, simple, and cost effective. The computer system automatically rejects or pairs the older adult with the available benefits. The benefits are sent to the social worker and to the older adult, so they can go over them together.

In addition, social workers conduct a needs assessment, physical and mental status, to match the older adults with the appropriate benefits. The needs assessment is derived from the Japanese Long Term Health Insurance, which allows for a universal social system, in which "eligibility is based on functional need, not on income, assets, or the availability of family caregivers" (Poo 151). After the assessment, if the older adults

need help, they are approved for one of the six levels of care, which fall into two categories, support level, and care levels (Tamiya et al. 296). The first level, care level 0, is the lowest level and is intended for preventative care services. Levels 1 to 5 are part of the support levels and are designed for assistant services. Care level 1 is for the lowest care required, and the other levels increase to the most severe case of needed care (Tamiya et al. 296). Each level provides eligible older adults with a set budget to spend on their long-term care services and health care needs (Figure 13). The budget allows the older adult to arrange their services or have them organized by the Elder Benefits Office. Furthermore, this office has a designated individual that takes public reports on the performance of the benefit programs and handles complaints to promote quality and safety of the continuum care infrastructure. This integration allows older adults to access comprehensive social service benefits to be able to age in place.

Similarly, the Elder Benefits Administration covers costs for professional caregivers and informal family caregivers. A similar program is in place under the Office of Supportive and Caregiver Services, which provides transportation, adult daycare, and caregiver supports (AOA). Under the existing Home and Community Based Long-Term Care several programs provide limited founding and support to family caregivers for a range conditions, such as Alzheimer's disease. The new administration would improve the existing programs and supplement them with more funding and resources for older adults. For instance, the new administration will cover a percentage of home care and institutional care, with the individual covering the other portion, which is not currently available to all the people over the age of 67. Covering part of the cost of caregiving will encourage families and communities to care for the elderly (Poo 152). Families and

communities "cannot rely on nursing homes to provide the needed services and care, not only because nearly 90 percent of Americans want to stay at home, but also because the cost of institutional care is astronomical: $84,000 per person per year, for thirty months, on average" (152). The needs assessment would determine the eligibility and percentage of costs for home care.

The number of professional caregivers is not sufficient today, and, given current trends, they certainly will not be adequate for the baby boomers in the future. In order to get closer to the needed number of 828,500 home care jobs, other labor policies must be implemented to improve the quality of jobs and salaries (Poo 161). Working condition improvements are needed to retain workers and provide adequate training to care for older adults (161). Every state should be responsible for developing, training, and maintaining their home care workforce. Training for professional caregivers should be "developed in partnership with consumer groups and informed by past efforts to identify core competencies, skills, and knowledge to provide quality care" (162). Also, immigration policies should be implemented to provide a path to citizenship for immigrant workers, especially women, who take care of the older adults (163). The immigration policy should include a temporal visa program to bring in caretakers on a contractual basis to offset the expected shortage of caregivers (164).

Equally, the Elder Benefits Administration needs to provide a support system to the informal caregivers. As younger family members or communities struggle to take care of aging adults, they need financial support and training. As stated above, the informal caregivers are paid a percentage of the cost. The benefits program increases the

participation of family and other community members for the care of older adults. Additionally, each state's Elder Benefits Office will provide free training and counseling to family members caring for eligible elders. The individual local offices will determine the amount of training offered to each caregiver. However, counseling is free and can be accessed by qualified informal caregivers once a month.

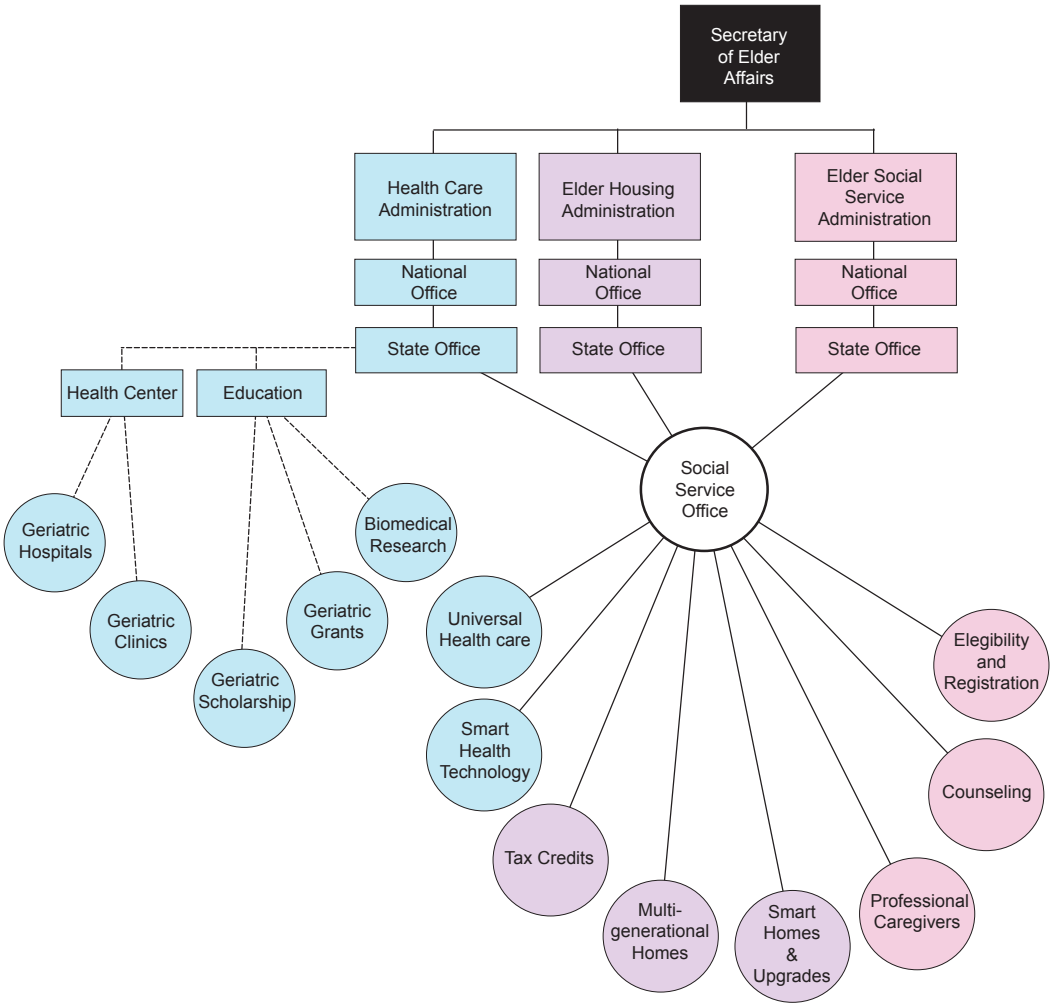
The Elder Benefits Administration is also responsible for providing adult day care. Adult care programs "are emerging as a viable local option for functionally disabled adults who want to maintain their independence in the community" (Padula i). The continuum care infrastructure broadens this definition of adult care, to include any older adult over the age of 65. This administration would take over the existing Office of Supportive and Caregiver Services to continue to partner up with local nursing homes or social institutions, like a seniors' center and churches, to provide day care for at least six hours of the day for the business week. The daycare would be free of charge for every older adult regardless of income and assets. The community providers would obtain tax credits, as to encourage more participation. Arts and craft classes would be held in adult daycares, which will be taught by volunteers. In the case studies, Linda and Juan attend daycare on a regular basis in order to socialize and be involved in the community; and, Akina used to attend daycare before she died. Nancy, who is the youngest of the four older adults and an artist, volunteers twice a week to teach an art class. Adult daycare programs are indispensable for empowering older adults to maintain connected in the community.

In addition, the Elder Benefits Administration is responsible for other benefits and entitlements for older adults, of which many are part of the existing Administration on Aging. These benefits are for older adults that have very low or no income or are handicapped (AOA). The Supplemental Security Income, which was passed in 1974 by the Nixon administration, will be taken over by the Elder Benefits Administration (Poo 180). However, it will be decentralized so that each state's Elder Benefits Office deals with their resources and distribution. This program aims to reduce the number of future elders living in poverty. Currently, the Supplemental Security Income gives a monthly check of up to $698 for an individual and $1,048 for a couple (180). But, as the costs of living increases and with an inflation of 3.4 by 2030, the amounts will increase up to $2,373 for an individual and $3,563 for a couple ("United States").

Similarly, the Congregate Housing Service Program, which "provides meals, housekeeping, personal care, and transportation" that stopped receiving funding in 1995, will also be taken over by the Elder Benefits Administration (Poo 181). Older adults having difficulties with three or more activities of daily life are eligible to receive this program. Lastly, the Supplemental Nutrition Assistance Program, which provides food stamps for eligible Americans, will take the older adult portion and integrate it with the Elder Benefits Administration. The new administration would also appropriate the existing OAA Nutrition Program, authorized under the Older American Act, which provides "access to healthy meals, nutrition education and nutrition counseling" to adults age 60 and older ("Nutrition"). The new administration would scale it up from its current capacity of 5,000 nutrition service providers that serve over 900,000 meals a day by a threefold increase. The objective is to have all elder services in one central location, as to

diminish the paperwork required to receive social services. The central location will also decrease the stigmatization associated with certain social programs, and the programs will be fully utilized (Poo 181).

Figure 14 Elder Affairs Executive Department Administrations



Source: Guadalupe Aguilera Corona ©
The Elder Affairs executive department's organization for each administration—elder housing, health care, and elder social services— and its related programs.

In summary, by 2030, the nation of the young will become a nation of the old, as 68 million people will be over the age of 65. Given the lack of trained individuals in the field of aging, the existing geriatric and gerontological social services, and health care systems will not be prepared to meet their needs. CRISIS 2030: Aging at Risk analyzes the issues affecting older adults, and presents strategies and policies needed to remedy those issues. The primary strategy is to create a continuum care infrastructure called the Tri-Net to provide affordable smart housing, accessible and quality health care, and adequate home care. This infrastructure uses exiting federal programs and technology at its core to provide solutions to social isolation, mobility, and cognitive issues, and other physical impairments as to allow older adults to age in place. Four theoretical older adults are presented living and coping in the future. These case studies provide a range of lifestyles and or dilemmas. Their distinctive backgrounds and attitudes mirror a diversity of types of future 2030 older adults. Thus, their life stories are used to demonstrate how current issues facing older adults can be solved by using innovative programming and technology. The proposed policies should be passed so as to provide a safe net for those individuals who have worked all their lives to contribute to the national economy. As members of society, older adults can pass on knowledge and wisdom to younger generations. The younger generations that are adding the social services should think about their future, which despite their optimistic views can bring them unforeseen desolation in old age.

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CHAPTER 9: AFTERWORD

Chapter 9: Afterword

We can only slowed down aging, but we must all inevitably die. The physical body will die and for those who believe in life after death, the soul or being will continue to live in another plane of reality or heaven. Aging is the culmination of years of experience. The last years of life should be a positive experience as they are the last good memories we will ever have. Few will be lucky to die of natural causes and others will have dedicated caregivers. But, many will suffer and will die alone. Life circumstances will determine the final outcomes.

If life is to be seen as a series of probabilities, then we can improve the probabilities by making changes for the benefit of everyone. To change the odds for better end of days, we must provide social supports. Social supports like better health benefits, tax credits, better housing models, and investment in technology. We must think beyond out own present situation and start to plan ahead. Everyone dies.

Today you might feel like you are in your prime and nothing can go wrong, but time never stops. One way or another you will feel the burden of aging. Your grandparents might be sick and some of them might already be dead. Your mother or father might be starting to forget little things or they have become disabled and you are now their caregiver. At the same time, you might have also started to notice the reduction in your bone mass and muscle or your lung function has declined. The point is that aging is not isolated and even if you don't have any family fellow citizens will still affect you.

The invisible connection between every human being is almost un-perceivable. But we are all affected by the actions of others. If I do you harm, inevitably I will do harm to myself by the web of life connections. Thus, we must take care of each other, so that we might be taken care. We live in a capitalist society, but even capitalism understands the merits of having a healthy and productive society. If we do not properly take care of the elder populations, the social burdens will be worse as private citizens have to deal with their local populations to collect private capital. This in turn will cause a new depression, as citizens would abstain from purchasing goods and services. It is a circle.

The United States is on a tragic collision path with the upcoming wave of retirees. The first step to change the course is to open your eyes and see the upcoming event. Second step is to understand the players and variables at hand. This will relates to the aging demographics and their issues, discussed in chapters one and two. Third step is to think about all the alternative solutions. To considered the benefits, consequences, and investments needed for each solution. This thesis presents one of the thousands of alternatives. Step four is to commit to a solution and developed a plan. The plan for the thesis is discussed in chapter nine. The final step is to share the plan and invite others to make the plan a reality.

This is my solution to the impending aging crisis. I have discussed the problems with the parties involved and provided a solution. My view of the future is optimistic, humane, and dignified. I shared my solution and invite you to take part in it so that we might change the course of collision. Or may my ideas inspired you to become involved

with the aging community. As Morris Berman said, "My own solution to our contemporary cultural crisis…is certainly a long shot, but at least there is some historical precedent for deliberate acts of cultural preservation forming a geological accretion of their own and eventually turning things around."[36]

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APPENDIXES

APPENDIX A

TYPES OF RETIREMENT HOUSING AVAILABLE

First, there is independent housing. This housing type rages from a new town, a village or a small subdivision with freestanding homes sites or condominiums with little or no services, to a congregate setting with a full range of services. There is the detached dwelling unit type, which may be situated adjacent to congregate housing units on a campus, or clustered in neighborhoods throughout a campus. They may consist of duplex dwellings, individual cottages, or garden/village homes. The advantages of living in a detached dwelling unit are similar to those of condominium living: the residents enjoys complete independent living, yet also has the benefits of a menu of services available on an as-needed basis, including dining services, social and recreational services, educational programs, etc.

The units are single-level and smaller than average family homes. Each independent living unit in a congregated setting has its own living space with a kitchen or kitchenette and a complete bathroom. Individual washer and dryers are usually not necessary in the design of senior housing. Many independent living units provide personal emergency response systems integrated into the facility's security scheme, an important determination for seniors. Top service choices are food and beverage service, social programs, cleaning services, recreation services and activities, including group or individual travel planning, exercise clubs, craft clubs, and card clubs; transportation; and community outreach organizations. Additional amenities that rate as essential include meeting rooms and libraries, convenience stores, a chapel, and beauty and barber salons.

Less basic amenities might include pharmacies, flower and plant shops, gift and antique shops, financial advisors, and other retail stores. Medical services can be provided as well.

A second type of independent living is congregate living, which has the same type of layout than the detached dwelling units, but they have program and services packages for residents. Regular dining service and transportation may be the only services offered to residents. Many tenants within congregate living provide for themselves in a setting that is much like normal apartment or condominium living. The units vary in size from 650 to 2,500 square feet they include single, double, or triple bedroom units. All at least have one bathroom, a kitchen, a dining/living area, and sometimes a den or laundry area. Most congregate living units are unfurnished. Parking space is usually provided for residents' cars.

A third type of is called the independent living, which allows individuals the option of independently managing their own small but private living unit. Area per unit may vary, but an average independent living unit is usually between 1,000 to 2,000 square feet. This type of unit always includes a bathroom, bedroom, and living room area. Most units also include a kitchenette/dining area. In facilities where meals are provided in a common dining area, residents may be encouraged to prepare their own meals to foster independence. Standardized architectural finishes are often offered, but units are otherwise unfurnished, and residents are encouraged to bring their furnishings to personalize their spaces. Many facilities also offer weekly laundry service for bed linen, but residents are also to do their personal laundry in available centralized facilities on the

premises.

Second, there are continuing care retirement communities, CCRC, residential campuses that provide a continuum of care—from private units to assisted living and then skilled nursing care, all in one location. Full-service CCRCs or life care communities provide an entire range of services, including independent living, assisted living, skilled nursing, and in some situations hospice. Many support services, such as activities, a fitness/health club, and a full range of medical services are provided. CCRCs can range from communities of detached housing to apartments in an urban high-rise or other single building to clustered buildings in a campus-like setting. In full-service CCRCs, the contract provides for full or lifetime health care as needed with no substantial increase above the monthly payments made in the independent living unit. If residents deplete their financial resources, the CCRCs assume the burden of payment. Modified-service CCRCs provide for a guaranteed limited number paid days in a nursing home bed, and fee-for-service CCRCs.

Third, there are assisted living facilities, ALF, which aids an individual in maintaining as much independence and freedom as possible, except for periodic assistance with such specific tasks as bathing, dressing, medication dosage, transportation and similar needs. These types of facilities can range from formal organizations to smaller, informal organizations of individuals who come together for housing, food service, and a low level of care and activities of daily living, ALD. Residents have their private apartments in the assisted living model, and may share living space in the other residential care models. These facilities do not ordinarily provide for nursing services but

do include activities of daily living, such as transportation services, walking, climbing or descending stairs, eating, dressing, bathing, toileting, and other personal hygiene.

Assisted living facility may be freestanding or be an element of a CCRCs, a life care community, or an adult retirement community. ALFs within larger adult retirement communities are becoming necessary, as managers have realized that alternatives to a skilled nursing facility had to be offered. ALFs tend to be smaller than independent living units, and many communities have converted their efficiency units to ALFs when design and layout offer the option. In many places, ALFs have been redesigned as residents have aged in place. The advantage of assisted living is that multiple residents can share common services. Their services may include meals, transportation, periodic nursing, security, housekeeping, etc. Many ALF residents may still be fully capable of cooking, housekeeping, and self-transportation, and may choose to continue providing these services for themselves as long as possible. Within the structure of assisted living program, a certified nursing assistant or licensed professional nurse, LPN, is required to make three daily rounds of the residents' units to make a security check as well as to offer assistance with areas of task specific need. In some ALF developments, housing units are identical to independent living units. The unit size is made smaller by the deletion of the kitchen/dining area by as much as 150 to 200 square feet. Most residences are one-bedroom units with a living room and bathroom.

Fourth, there are skilled nursing facilities, SNF, which is a facility dedicated to the maintenance of the lifestyle quality and health care needs of multiple individuals within a setting of commonly shared service, social, recreational, and educational programs,

medication, etc. Skilled nursing units may be part of a larger campus of a congregate living setting, offering the availability of step-down care for temporary convalescing to campus residents. SNF are highly licensed facilities staffed with licensed administrators and offer a full range of long-term-care medical services. The regulator requires that a certain number of registered nurses, RNs, licensed practical nurses, LPNs, licensed vocational nurses, LVNs, and nursing assistants or aides be on staff. Sometimes floors or wings of the facilities are designated for specified levels of care. SNFs are designed to provide round-the-clock care to meet all health-related, psychological, and other personal and medical needs of residents requiring constant care. The services of RN are available seven days per week and 24 hours per day.

The types of individuals who become residents in a skilled nursing facility do not require the acute level of care delivered by hospitals, and SNFs do service rehabilitate, substance abuse, and psychologically dependent patients requiring long-term maintenance or shorter-term rehabilitative medical care. The move to a skilled nursing unit signals a more permanently dependent and final stage of life. Skilled nursing residents are usually housed in private or semi-private rooms. Although, SNF residence tends to be long-term, it is not acute or sub-acute in nature. The average amount of space allotted to a resident's personal area is approximately 150 square feet for each patient in a semi-private room, and 280 square feet in a private room. Each unit consists of a bedroom with attached toilet room, which can contain a shower for bathing, depending on the abilities of each resident.

All SNF meals are served in a common dining room, which can accommodate

normal and handicapped dining. Meals are served at bedside to those who are not ambulatory. Residents usually enter a skilled nursing facility when the regular need for medical attention becomes a burdensome to maintain under normal living conditions. SNFs usually range in size from 40 to 250 beds. Residential wing is usually attached to a common core of services, such as dining, social, and recreational services, physical therapy, common bathing, etc. Many of these facilities offer transportation and arrange for outside community organizations to provide extension programs.

Fifth, there is cohousing, which refers to a residential arrangement that combines private home ownership with shared community facilities, activities, and decision-making. Cohousing residents live in smaller than average units and user-shared facilities in the "Common House", including a large kitchen and dining room for optional shared meals, regular meetings, and social events. Other shared spaces may include an office, workshop, storage, children's playroom, laundry, exercise, and guestrooms, as well as indoor and outdoor sitting areas.

The cohousing lifestyle allows people to transcend individualism while still maintaining their independence and individualistic needs. Chris and Kelly Scott-Hanson's list for benefits of cohousing: safe and supportive environment, opportunities for social interaction and contribution, sharing resources, a place to have visiting family and grandchildren stay and play in common house guestrooms and playrooms, environmentally friendly, preserving green space, lower living and utility costs, and time saving. At an average size of 15 to 35 units, cohousing developments are relatively small. However, by addressing larger urban and regional design issues, cohousing provides

models for better development practices in which residents could benefit from the opportunities available in their immediate vicinity. In this way, cohousing communities could contribute to mixed-use, mixed-income, and intergenerational communities that are more similar to traditional villages — and represent a dramatic change from typical suburban communities. In general, many cohousing projects include approaches to energy efficiency and resource conservation within an affordable budget. The results show that, depending on the design, residents of some cohousing communities use 50 to 75 percent less energy for heating and cooling than they did in their previous homes for a family of three.

Cohousing neighborhoods, on average, occupy less than half as much land as the average new subdivision for the same number of households, and 75 percent less land as the same individuals did before moving into cohousing. Members of cohousing communities drive about 60 percent less than their suburban counterparts. These cost-saving and environment-saving strategies are directly transferred to the cohousing residents, as well as their larger communities and regions. The result of a search of cohousing acreage sizes and number of units per acre in the United States is not surprising. In the more rural areas and low-density states, the number of units per acre is relatively low, while in Boston and Echo village the density per acre is very high.

Sixth and final, there are Alzheimer's and special units, which in terms of basic services offered, these units are similar to skilled nursing units. The individual design, however, and are specialized according to the specific conditions of the patient population they will be serving. Alzheimer's Disease encompasses about 20 different

conditions of dementia, each with its distinct traits and symptoms. Sine dementia patients are confused and may misinterpret some visual cues, it is important that the design of the unit be simple, to allow patients freedom of mobility and minimum anxiety. An uncomplicated physical layout is essential. Because confusion among Alzheimer's patients can trigger episodes of anger when a door, window, or corridor is not where it should be, it is important to create a design where patients cannot harm themselves.

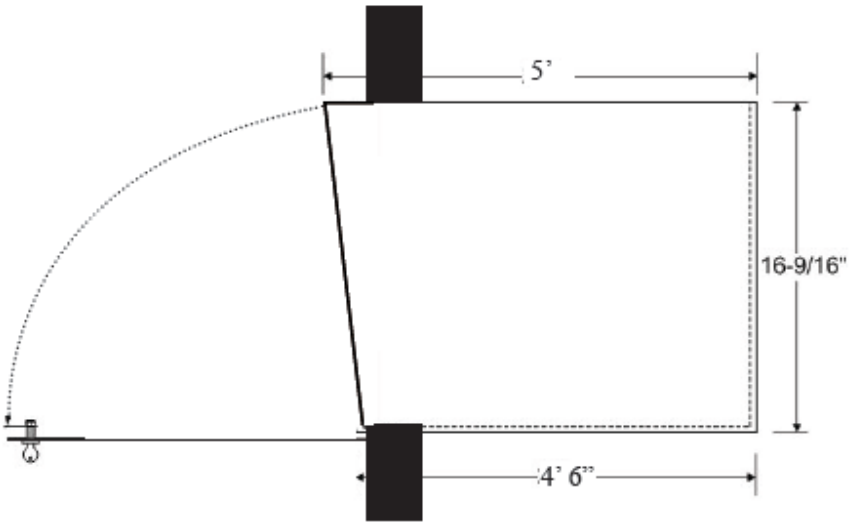
The general layout of Alzheimer's unit will often be shaped in a square or as a straight, long plan; it may also include a commons quadrant. Each plan offers residents a simple, direct, clear pathway to walk without getting lost.

Consideration for dementia design:

- Simplicity in verbiage and symbols on-site signage.
- A lack of potentially dangerous objects, such as tripping and tangling hazards with floor surfaces, drapery cords, electrical appliances and outlets that present risk of electrocution, etc.
- Simplicity and ease of location and use of light switches, grab bars, and handrails, appliances, faucets, showers, and toilets.
- Use of furnishings that are impervious to abuse and incontinence, such as tight seat bottoms and backrests, cleanable surfaces wherever possible, smooth edges, and counterweighted case goods and tables.
- An adequate line of sight and surveillance points for staff and patients, to provide a constant means of orientation.

APPENDIX B

TECHNOLOGY PROTOTYPE



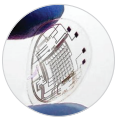
APPENDIX C

OLDER ADULT TECHNOLOGY CASE STUDIES

Linda


Exoskeleton


Smart health device


Eye implant


Medicine dispenser


Personal robot


Autonomous car


Smart house


Aquaponic garden

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Juan


Smart bathub


Smart health device


Medicine dispenser


Universal remote


Smart toilet


Universal tablet


Personal device


Semi-smart house

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Nancy


Anti-aging pills


Personal device


Micro-aparment


Universal tablet


Compact car


Autonomous cart


Virtual reality glasses


Smart instrument

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Akina


Compact car


Autonomous cart


Virtual reality glasses


Smart instrument


Multi-gen. housing


Health monitor


Smart medicine


Social media

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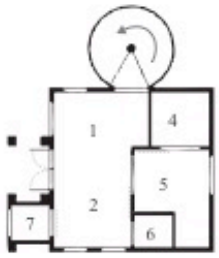
APPENDIX D

HOUSE TYPES IN CASE STUDIES

LINDA
SMART HOUSE
450 SQ.FT.
GROUND FLOOR
TOTAL: 950 SQ.FT.



LEGEND
1. kitchen
2. living room
3. family room
4. bathroom
5. bedroom
6. powder room
7. mailbox
8. dining room
9. closet
10. garage
11. garden/patio
12. hallway

JUAN
REHAB HOUSE
1450 SQ.FT.
GROUND FLOOR
TOTAL: 3300 SQ.FT.

NANCY
SMART APARTMENT
650 SQ.FT.
UNIT
TOTAL: 650 SQ.FT.

AKINA
HOSPICE UNIT
450 SQ.FT.
UNIT
TOTAL: 750 SQ.FT.