

Emerging Platforms for Aging in Place

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Summary

The world is aging. People are living longer across the globe and as we live longer, chronic disease rates increase. Much research is being done to develop technology to allow more people to remain in independent living situations as long as possible.

Key Points

- The over 60 population is growing dramatically.
- Independence, mobility, productivity, creativity, and being useful are all important themes for the aged population.
- By studying the effects of aging on daily life, technology can be developed that allows people to age in place.

IN 2002, THE WORLD WIDE AVERAGE OF people 60 and older was 10 percent across the world.¹ By 2050, the over-60 group will be 21 percent of the population (Exhibit 1). More than 2 billion people will be over 60. With increases in the older population comes a complementary rise in chronic disease, which will be a huge burden on our health care system. Adding to the burden on the health care system are various health professional shortages.

New models of care are emerging in response to these issues. There is a shifting from a reactive model to a proactive model. This is a change from an episodic way of caring for people versus an ongoing or continuous process of care. Adoption of proactive models remains slow and tentative.

The best example where a proactive model has been adopted is with diabetes. A doctor or nurse cannot be with a chronic patient every hour of every day. Patients have to learn to take care of their diseases themselves. Technology has been developed to help people take better care of themselves. Insulin pumps and home glucose meters are two examples.

The same model that pushes technology into the home for diabetes is going to begin appearing with heart disease, cancer, and a whole host of other diseases. This is going to start taking the form of everyday technologies. One example already available is a phone that also serves as a way to check blood glucose levels

One company developing technology to allow older people to better care for themselves and age

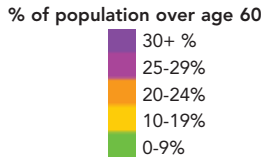
in place is Intel. Intel has a team of ethnographers, designers, and engineers devoted to aging issues. Ethnographers are people who formally study how people behave and their health care needs. The designers understand how the physical embodiment of technology lives in the environment, and how people interact with technology. Using data gathered by the ethnographers, the development team looks for opportunities to apply technology (i.e., how technology might be able to help in a certain situation). The designers then come up with ideas and the engineers will build prototypes. Those with the highest value both in potential for the marketplace and for helping people are tested for efficacy. These technologies are then considered for production.

Intel started the Global Aging Experience project in 2006. The objectives of this study were to get a global perspective on aging, and to understand the social and cultural differences in people's experience of aging and health. The researchers wanted to challenge prevailing assumptions of what it means to grow old. Another purpose of this project was to identify strategic opportunities where technology has a chance of making a difference in people's lives.

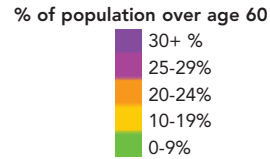
In this research, in-home two-day-long observations/interviews were conducted with people in Europe, Sweden, England, Ireland, Germany, France, Spain, and Italy—all areas with large aging populations. In this coming year, the research will primarily focus on India, China, Japan, Korea, and some of

Exhibit 1: The World is Aging - 2002 vs 2050

2002
WW Average Age 60+: 10%



2050
WW Average Age 60+: 21%



Source: United Nations "Population Aging 2002"
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By 2050, 21 percent of the world population - nearly 2 billion people - will be 60 and older

Latin America. The ethnographers also interviewed experts and caregivers in each of these regions. The sample in each country included five to six people with cognitive decline, five to six people with a long-term limiting physical disability, and two to three healthy people all over 65. A range of people between 65 and 93 were interviewed.

Ethnography is the dominant methodology of anthropologists. It involves long-term field studies with people in their own settings—homes and communities. It is designed to produce an understanding of an individual’s way of seeing the world. Ethnography provides an understanding from the individual’s perspective of what it means to grow old, of what it means to be infirm, what it means to be facing cognitive decline, and also of what these issues mean for caregivers.

Although this type of research has a small sample size, it provides very intensive detailed observations and interviews. Typically, the researcher works from an ethnographic script using semi-structured and open-ended questions. The interview is videotaped for later reference. Once all the information is gathered from the interviews, the researcher looks for common themes and threads.

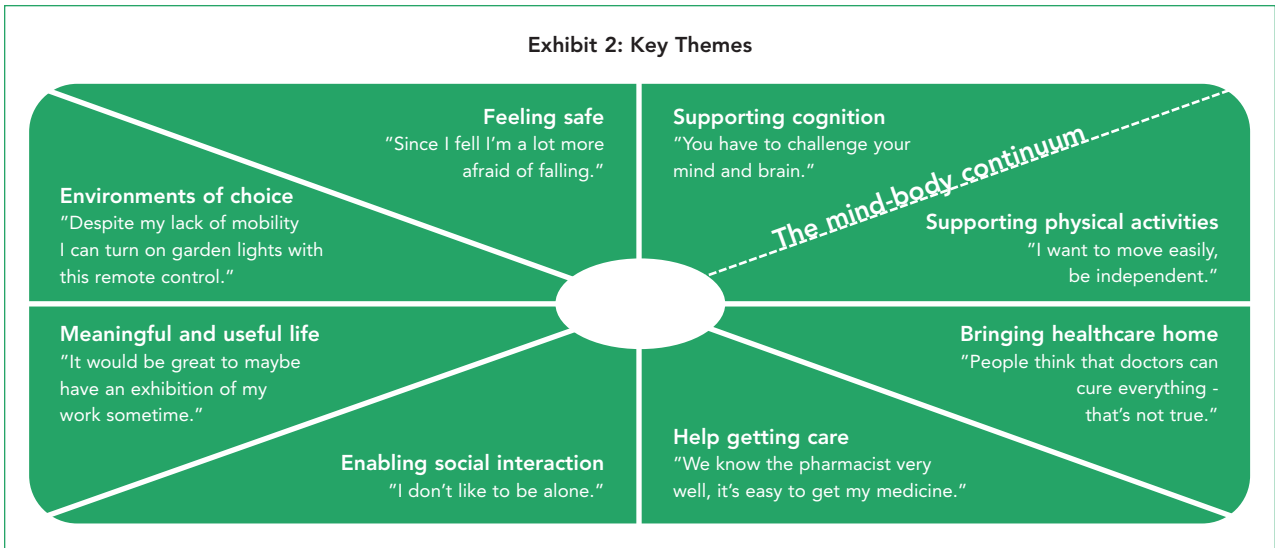
Some of the themes and patterns that emerged from the first phase of the Global Aging Experience are illustrated in Exhibit 2. These themes are not new, but it’s important to understand the themes with respect to applying technology.

One theme that emerged from this project was that being depended on by someone or something is important to the elderly. For example, an 80-year-old in Ireland tended sheep. The animals’ dependence on him was incredibly important and provided him motivation. Tending the sheep provided him an opportunity to get outside and do something physical. Being depended on motivates many elderly people to remain independent. Researchers are trying to find a way to introduce dependence into people’s lives through technology to enhance and support independence among the aging.

Another theme that emerged was the disruption of morning routines as an index of aging. One female participant in England would get up each morning and go downstairs to make tea. She would then bring the tea upstairs to her husband still in bed. When her arthritis became so severe that she could not make it up the stairs anymore, this was a pivotal event to this couple. The fact that she could not navigate the home was an index for this couple that they were becoming aged. It started a conversation about the need to move to an assisted living facility.

Another theme was mobility. A woman in Milan had strategically placed walking sticks throughout her home in order to maintain her mobility. Mobility within the home and outside the home is important to activities of daily living. Applying technology to this issue might mean monitoring or sensors in a home to assist mobility.

Exhibit 2: Key Themes



Being productive and creative in later age is closely related to physical and mental health. Some examples from different parts of the world include a woman who made 150 fans for her son's wedding and then decided to start her own business selling fans in the neighborhood. A gentleman in southern Germany developed sermons and began to distribute them on CD. Technology obviously supported his behavior.

Gardening is an important activity to many elderly for a number of reasons. It is physical, social, and collaborative, creates dependence (as discussed earlier), and provides meaning and identity in a very fundamental way for a lot of people.

A final theme is about caregivers. Most people at some point in their life will be a caregiver for an aging relative. Research is identifying ways technology can assist caregivers.

One example of applying technology to allow aging in place is the use of medication-prompting devices to assist medication compliance. Noncompliance with medications and the resulting deterioration in disease control can be a reason for an elder to lose his or her independence. One aspect of noncompliance is the patient forgetting to take a particular medication at the appropriate time. Through ethnographic research, it has been learned that people take their medicine based on an event such as a meal rather than at a specific time. In one project, a sensor network that could detect some of those key medication taking events was developed. Even more importantly, the system was designed to detect when those events were altered or changed because that is when people are most likely to forget their medicine. If the technology can determine the patient did not have breakfast one morning, an electronic prompt

would remind him to take the medication usually taken with that meal. In this particular project, caregivers used a variety of different sensors in the home such as motion sensors and switches for the bed, medication box, and refrigerator.

Using several months of data from home based sensors, patterns, and deviations of those patterns can be identified. In this particular project, termed "contextually based prompting," caregivers tried to raise adherence (see Exhibit 3).

Although this project was targeted at medication compliance, examination of the data found other possible uses for this type of technology. In one example from this project, data from a 24-hour period in one woman's house was examined. At 2:45 a.m. and 4:45 a.m., the woman got out of bed, opened and closed the front door, and went back to bed. Imagine a system where a call center monitoring these sensors notes that she left her house at 2:45 a.m. and sends an alert to the police or a relative. This type of monitoring could be used to determine if a patient is safe and able to be at home or not. This would be an objective way to help families make better decisions.

Another use of this type of technology may be in an independent living facility to identify patients who are not as active as they were previously. The facility may be able to initiate an intervention early and prevent further decline. Interfacing electronic medical records with medication monitors is another possibility.

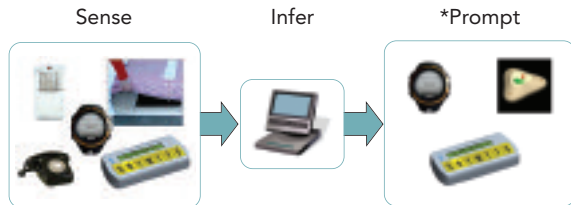
Another project developed in collaboration with a Parkinson's Research foundation is to explore how technology can be used as a research tool to assess progression of the disease. This project combines several existing and newly developed tests into a single research prototype for home use." The prototype

Exhibit 3: Context Aware Medication Prompting

Hypothesis

- 1 - With the appropriate sensors, actuators, and software, we can build a system to determine that there is a predictive relationship between patterns of activity and the likelihood of taking medications on time.
- 2 - Using automatic, contextual prompting based on time, place, and activity, we can significantly improve medication adherence.

Approach



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Exhibit 4: Intel's Parkinson's Research Prototype (aka At Home Neuromotor Device)

5 Diagnostic Tests at Home:

Tremor watch, speech analysis; finger tapping test; Perdue peg board; reaction time test

3 Fold Hypothesis:

- We can measure what we want
- We can correlate at least as good as corresponding subset of PDRS
- People will comply with at home testing



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contains a tremor watch, speech analysis, finger tapping, Perdue peg board, and reaction time tests. The research prototype is currently being tested in a feasibility pilot study. (Exhibit 4)

Because Intel is not a healthcare company, it has built collaborations with government agencies and universities. Intel belongs to Everyday Technologies for Alzheimer's Care (ETAC), which is a unique consortium to address the needs of the millions of people worldwide who are living with Alzheimer's disease. The Behavioral Assessment and Intervention Commons (BAIC) is an academic/industrial collaboration with the Oregon Health & Science University around behavioral markers and health outcomes. This venture is to fund research taking these technology ideas and scaling them up to hundreds of households to obtain enough data to correlate the sensors with behavior and the behavior with the progression or onset of disease. Intel is one of the founders and national chair of the Center for Aging Services Technologies (CAST), a collaboration among industry, academia, and long term care providers whose mission is to lobby the federal and state governments for aging-in-place research funding. Intel also recently launched the Technology Research of Independent Living Centre in Ireland, which is the largest Aging in Place research center. It is a collaboration with the Irish government and three universities in the field of social connection, cognitive function, and fall prevention.

Intel has established and works with a number of organizations to promote open, standards-based healthcare solutions that will make possible new

models of care. Continua Health Alliance is an open industry alliance of healthcare and technology companies that joined together to establish interoperability of medical devices in the home. Dossia is a consortium of large employers united in their goal of providing employees, their dependents, retirees, and others in their communities with an independent, lifelong health record. This personal health record would stay with an individual even if they change jobs. The American Health Information Community (AHIC) Advisory Board of the U.S. Department of Health and Human Services was chartered to accelerate the development and adoption of health information technology.

Applying technology that is beneficial and does not disrupt people's experience of who they are and how they are living their lives is the overall goal of all the research discussed here. If a technological device demands a person's attention in ways that are very unfamiliar or very complicated, then the design has failed. A goal is to make the interaction with the technology as unnoticeable as possible.

Conclusion

There are many exciting developments occurring with integrating technology into elderly people's lives to allow them to successfully age in place. Many of these products will begin reaching the marketplace within the next five years. **JMCM**

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Reference

1. United Nations. World Population Aging 1950-2050. 2002. Available at www.un.org.