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# Exploring the Ecology of the Elderly

**Vivek Anandapara**

Computer Science  
Indiana University  
[vranandp@indiana.edu](mailto:vranandp@indiana.edu)

**Shruti Bhandari**

School of Informatics  
Indiana University  
[shbhandar@indiana.edu](mailto:shbhandar@indiana.edu)

**Pin Sym Foong**

School of Informatics  
Indiana University  
[pinfoong@indiana.edu](mailto:pinfoong@indiana.edu)

**Sam Shoulders**

School of Informatics  
Indiana University  
[ssshould@indiana.edu](mailto:ssshould@indiana.edu)

**Abstract**

The ecology of the elderly is a holistic approach to understanding the artifacts surrounding the elderly and what role these artifacts play in the daily lives of this significant population. We present the reasoning behind a focal shift from aging and disabilities to aging and abilities. This is followed by a design of a digital bookmark prototype linked to a library reading club program that aims to increase socialization and relevance of the specific user group of elderly women living at home.

**Keywords**

Elderly women, sensors, electronic bookmarks, aging, pervasive computing, books, product ecologies, socialization

**ACM Classification Keywords**

H.5.2 [INFORMATION INTERFACES AND PRESENTATION]: User Interfaces - User-centered Design

**Introduction**

Aging can be seen as a time of transition where the artifacts in a person's life are changed to assist or compensate for changes. While many helpful devices are being built in this area, researchers are also finding that the acceptance and usage of Assistive Technologies (AT) by the elderly is mediated by their

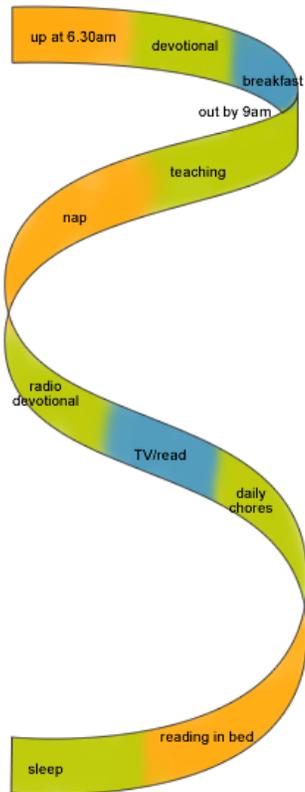


Figure 1: Sample Daily Routine Plotting



Figure 2: Photo from Elderly Lady's Home

view of what these devices mean [2]. In other words, devices that identify strongly with being “disabled” have a lower chance of adoption into the daily lives of the elderly. For example, Personal Cognitive Orthotics (PCO’s) [12] are reminder systems that compensate for memory loss. However, this product is not just aiding a disability, it can also *underscore* it (note the naming of this family of products as “orthotics”). Other designs such as the Aware Home [13] or telemedicine systems [15] depend extensively on pervasive monitoring of the elderly raising issues of the loss of independence and privacy. We present in this paper an alternative perspective. The research questions are “How can we design products that help elderly to live productive and active lives? Do these products represent a *positive attitude* of being an elderly person?” What follows is a description of our exploration of the elderly ecology. We first detail our insights from personal reflection, an exploratory interview, followed by the literature review that these insights inspired. Next, we present both our concept ideation and our final concept direction. This paper ends with a proposed prototype evaluation plan of our design and discussion of future directions for research.

### Ecology of the Elderly

Our exploration of the elderly ecology was inspired by the seminal works of Jodi Forlizzi, Peter Paul Verbeek and Klaus Krippendorf . The “ecology of the elderly” refers to the constellation of artifacts and the emotional relationships that are fostered through interaction, which Forlizzi refers to as product ecologies [4-6]. The role these artifact play in shaping both perception and the behaviors of both the elderly and caregivers is of great importance to our design. Verbeek describes this as material semiotics, [18]. Furthermore; Krippendorf’s

theories on product semantics which focus on the exploration of the context of use and interaction is vital as they are constitutive to meaning-making and value(s) [9]. These theoretical concepts of product ecologies, material semiotics and product semantics were analytical tools in our design process.

### User Research

#### *Routines of Daily Living*

#### *Personal Reflections About Elderly Relations*

Our initial exercise was a reflection upon the daily lives of an elderly person that each person in our design team knew. Our design team was comprised of both female and male designers from different countries. We plotted our observations of their day. The reflections were all about elderly women. We diagrammed what we saw as their day and noticed some common themes, which were that regardless of culture, elderly women focus on food, health, and caring for others. The method of plotting meaningful moments in the daily lives of the elderly was carried over into our camera study.

#### *Exploratory Interview and Camera Study*

To substantiate our observation we conducted an exploratory interview and camera study. We recruited three participants; an elderly woman living at home, the son of another elderly woman living with his mother, and a nursing home director. During the interview we asked them to construct their day and to reflect upon instances in their day that resulted in meaningful moments. We also left them with a disposable camera to photograph things that they provide meaning in their daily activities. The insights from this exploratory study indicated that *routines*,

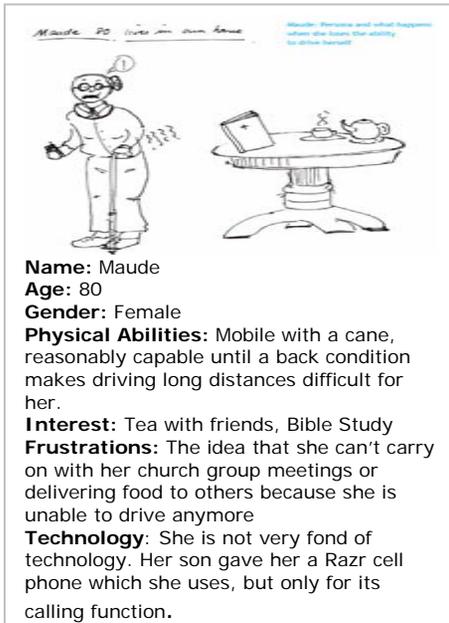


Figure 3: Primary Persona

*social connectedness* and *memory retention* are important values in the elderly ecology. We observed that their days are generally constructed around religious study or practice, social connectedness via phone calls or visiting, and cooking for others, or helping friends with domestic chores. The nursing home director said, "Personal routines seemed provide a sense of security and confidence for the elderly, especially when transitioning to assisted living".

#### Persona

Women have a longer life expectancy and with the aging baby boomer population, elderly women will become a significant segment of the population by 2011 [16-17]. This population is vulnerable to isolation due to loss of a companion often leads to depression, anxiety, and decreased socialization [7]. We formed our primary persona, Maude, from our reflective exercise, exploratory research and related literature (Fig. 3).

#### Related Research

Research for the elderly tends to focus on compensating for disabilities and other physical declines associated with aging. We felt inspired to take a different approach and emphasizing a positive view aging. By this we mean that we wanted to design an artifact that would improve the lives of the elderly by *supporting existing routines that help in preserving a sense of self-efficacy and relevance via social engagement*.

#### Links between Social Engagement, Routines and Relevance

Loneliness among the elderly indicates that it does not decrease, nor does morale increase with interaction and socialization with relatives, children. Friendships have

a comparatively stronger effect (although it is modest in absolute terms), as compared to interaction with relatives, which had essentially no effects [10]. Friendships based on mutual choice can have a positive impact on morale whereas relationships based on norms of obligation do not. Being chosen as a friend is an empowering feeling, implicit in this act is an acknowledgement of desirable traits. The above findings, when taken in view of the gradual loss of companions over time, help us to understand why isolation and depression are linked. The increasing isolation leads to less activity outside the home and consequently less social engagement. Research indicates a high correlation between lost routines and memory loss for elderly people [8].

#### Synthesis of Insights

Our exploration of the elderly ecology resulted the concretization of core values and secondary design values (Fig. 4). Maude's core values are friendships, a sense of efficacy (independence), avoiding loneliness, and wanting to interact and identify with things that make her feel good about being an elderly woman. The secondary values were focused on both maintaining personal space and having daily routines.

#### Brainstorming and Concept Ideation

With our core and secondary design values we began the process of brainstorming, persona role playing exercises [1], which was a process in which each member of the design team created a persona and engaged role playing of that persona based on our design values. This exercise was generative tool for concept ideation. The three areas were as follows:

**1) Video Messaging (Social Barter System):** helping others and maintaining independence, and for a

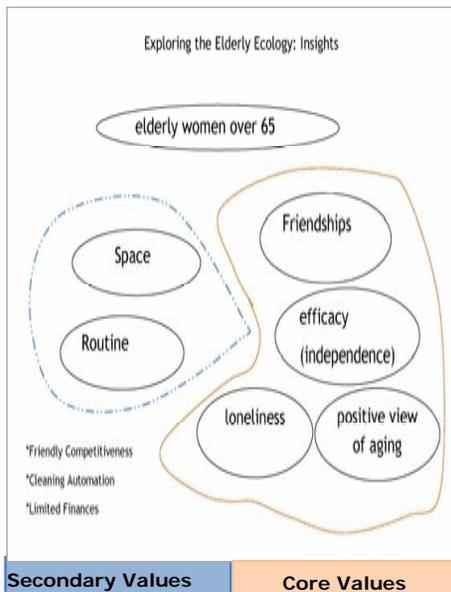


Figure 4: Synthesis of Insights



Figure 5: Video Messaging System

stronger ties amongst friends, potentially a handheld or Wii device (Fig. 5).

**2) Electronic Social Bookmark:** provide a sense of social connectedness, encouraging friendships, simulates presence, and has positive view of aging (Fig.6).

**3) Cleaning Automation:** improving personal space, a sense of efficacy, and independence; condition of house can be influential on emotional state of elderly women (Fig.7).



Figure 6: Electronic Social Bookmark

#### *Rubric for Concept Direction*

We weighted these concepts against our team's design requirements; reduced user visual acuity, an example of calm technology, storage of data not needed, aiding collaboration between users, wireless data transmission, real time interaction and minimal cognitive load. We also considered real-world constraints such as: time to construct design, feasibility of design, and potential cost to user. After extensive evaluation, we chose the electronic social bookmark as our concept direction. We refer to this design as the *Book Amigo*.

#### **Concept Direction: Book Amigo**

The Book Amigo concept modeled on our finding of religious reading groups. Based on our group reflection exercise, diverse religions have book discussion groups. We believe that reading is an activity that everyone engages in and people like sharing their views on their readings. The book is the center of our design and the bookmark is the vessel for a technology that would enhance the social activity of readers.

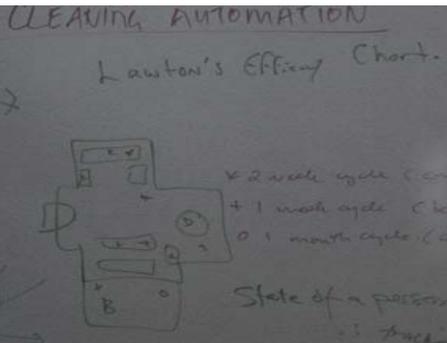


Figure 7: Cleaning Automation Sketch

#### *Acceptance of Book Amigo*

The design, *Book Amigos*, leverages on existing library-based reading promotion programs. *Book Amigo* members will be given a sensor-enhanced bookmark that records reading interest via motion, light and flex sensors. The library will aggregate this information and coordinate book discussions for people who show similar reading interests. The aim of the bookmark is to reproduce the sense of presence of another person when it signals that someone is reading the same or similar book. Research shows that contrary to popular belief, the elderly are not opposed to technology. However, the perceived dissonance between new technology and existing domestic spaces can lead to resistance to adoption [2, 14]. Thus, our design merely modifies an existing artifact in many homes, bookmarks, to support increased interaction.

#### **Book Amigo Prototype**

##### *Use Scenario*

Maude is looking forward to her library visit today. She has not been driving much since her arthritis started acting up. Today she getting a ride from a friend to the library to pick up 'Quiet Strength', the book her church's ladies book club is reading this month. At the book checkout counter, the librarian asks her if she would like to be a part of the Readers' Club. He explains that members will be given a digital bookmark that can be use to express interest in meeting to discuss the book, or similar books. The library will collect this information and match people for book discussions who indicate similar reading interests.

##### *Technical Specifications*

As she reads her book, she notices that her bookmark glimmers repeatedly at certain hours. She is amazed



Figure 8: Prototype Form Designs

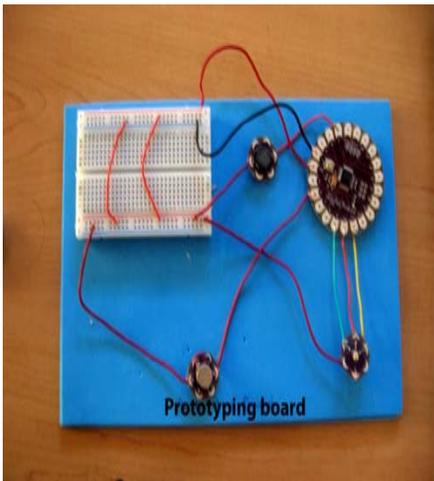


Figure 9: Prototyping Board

that there is someone else out there is also enjoying the same or similar book as her, as indicated by the pretty glimmer on her bookmark Maude wants to discuss this book so she slides the meeting button over to "Meet". The bookmark connects to the library's server, and two days later, she receives a call from the library inviting her to a Book Club meeting. The library also uses the data collected to recommend other books to Maude at the meeting (Fig. 7).

### Book Amigo Pilot Study (to be conducted soon)

The goal of the pilot evaluation is firstly to determine if *Book Amigo* does engender a feeling of social connectedness, when the *Book Amigo* responds to a reading signal. The second goal is to gather feedback on the visual and visceral reaction to *Book Amigo*. Before moving forward with more extensive sensor development, we chose to test these key components first. Thus, we designed prototypes with high visual fidelity, low functional fidelity; see Figure 8, to test our proof-of-concept. We used an out-of-the-box mini sensor kit known as Arduino and LEDs (Fig. 9). We will use an Experience Sampling Method (ESM) similar to the methodology utilized by Consolvo in her Ubifitt project. [3] Our plan is to use both text messaging and voicemail to get feedback whenever the *Book Amigo* glimmers. The results of the pilot study will be the basis of how we prepare and formulate an extended study of the *Book Amigo*.

### Future Objectives

One observation was that with a ubiquitous device such as the *Book Amigo*, the majority of the interactive meaning-making qualities are intangible due to the hidden activity sensing methods.

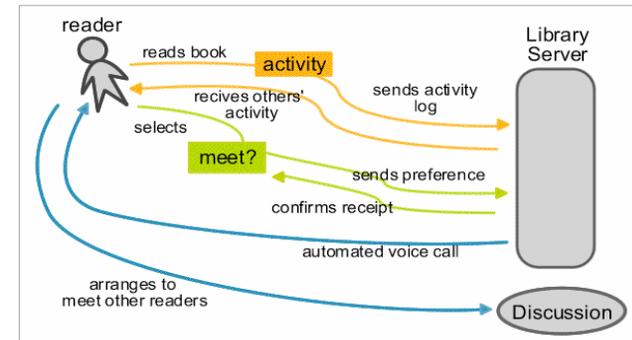


Figure 7: Flow Diagram of Book Amigo

We were confronted with a lack of tools to rigorously evaluate such a highly qualitative experience. Designs such as the *Book Amigo* pose a new challenge for designers attempting to evaluate the cohesiveness of their design. We derived theoretical inspiration from a paper written by Lim, et.al [11] that sets forth an approach for the design of aesthetic interactions. Their premise is that this can be achieved through the exploration of the *interaction gestalt*, which is the space in which the user's experience is shaped and manipulated by the design. We would like to expand this to the evaluation process of the *Book Amigo*. We would like to explore what tools are sufficient for the evaluation of the interaction gestalt of an artifact. Our future research is to explore the use of ESM and content analysis as possible methodologies for the evaluation of the *interaction gestalt* of the *Book Amigo*.

### Acknowledgements

We thank Dr. Kay Connelly, William R. Hazelwood for their suggestions, and support for this project

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