

# A Conceptual Design for a Smart Photo Album Catered to the Elderly

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**Abstract.** As Taiwan becomes an aged society, the problems caused by memory and cognitive impairments have added to the enormous medical care costs, increasing the burden placed on the next generation. Medical studies have found that adding brain-protective factors into daily life and engaging in mental activities that stimulate brain function, creative activities, or regular exercise can significantly prevent mental and memory loss. Therefore, this study used the concepts within reminiscence therapy to develop a smart photo album in order to improve elderly memories and ability to feel happiness. The user-centered design focused on care for the elderly to accomplish the conceptual design. Observation and interviews were first conducted to explore the needs and ideas of the elderly had regarding photographs (the discover step). Then, the key factors for design were analyzed and defined by affinity diagram (the define step). We founded 4 affinity factors relating to the mental ideals of the elderly: Memories (k1), Sharing (k2), Emotion (k3) and Lack (k4). Next, the scenario story was used to generate rich and innovative conceptual designs and to integrate new technologies (the develop step). In this study the smart photo album was named Fond Memories that presented two features: “Image memory sharing” and “Emotion detection”. These shared memories create empathy, relieve depression, and allow the elderly to enjoy memories with their families.

**Keywords:** Smart photo album · Reminiscence therapy · Conceptual design

## 1 Introduction

Population aging has become an inevitable global trend; coupled with the extremely low birth rate, Taiwan has quickly become an aging society where the elderly will soon comprise the majority of society. People’s bodies, senses, memories, and cognitive functions deteriorate as they age, and these the elderly often experience frustration, difficulties, and distress as they adjust. Hsieh (2002) found that the problems and obstacles the elderly face regarding their emotional adjustments are often ignored or underestimated. This may be due to the fact that their mood disorder is expressed by physical symptoms of aging, thus becoming masked depression. A 2006 survey taken by Global Views Monthly found that adults over the age of 70 are Taiwan’s loneliest

age group, comprising 20.3% of the total population. It was reported that the lack of companionship was the cause of their loneliness (Chiang 2006).

IEK (2011) also found that the environments in which Taiwanese senior citizens are typically active comprise at their home (87.7%), nearby parks (66.4%), and activity centers (34.5%) (IEK 2011). These statistics suggest that Taiwanese senior citizens prefer to stay at home. These citizens, who comprise men and women who lack exercise or are recovering from strokes, are more prone to the loss of memory and cognitive functions, even increasing the chances of contracting Alzheimer's disease (AD). However, the elderly in addition to physical disease and physiological function of the decline, their mental health can be not ignored such as Dementia, Depression, Anxiety, Stress, and Low self-esteem. Without immediate help and treatment, the Well-being of the elderly can be seriously damaged, and even their quality of life may be affected.

In recent years, a study conducted at the University of New South Wales also found that the elderly who watched more programming on the National Geographic Channel and documentaries on natural ecosystems scored significantly higher on tests for language and cognitive skills. Dr. Haruyama Shigeo (1996) also pointed out that sustained positive emotions release a type of  $\beta$ -endorphine in the brain that can help retain youthful and happy feelings and can even fight cancer cells. This sort of happy hormone can significantly improve memory, immunity, and spiritual happiness. Psychologist Dr. Enomoto Hiroaki (2013) found that the results of memory training using interactions between the five senses were the best and that memories related to feelings were the least likely to be forgotten (emotional effect).

Furthermore, Psychologists used memory therapy to improve the mental state of the elderly, improve self-esteem, reduce depression, improve their life satisfaction, reduce stress, have a significant impact (Haight and Burnside 1993; Matteson and Munsat 1982; Nugent 1995). Therefore, this study is based on the benefits of memory therapy to develop a smart album. We will explore the feelings and needs of the elderly when viewing photos, and then propose conceptual designs that integrate ICT. Smart albums look forward to meeting the wisdom of life, and to achieve a more comfortable, safer orange technology as the goal.

## 2 Research Method

An analytical framework based on user experience assist researchers and designers in understanding the thinking patterns and logic of users. In addition, this framework further allows researchers to objectively identify problem patterns, assisting them in accurately designing user-centered products. Numerous related studies show that the users interact with systems to pursue the feelings and psychological satisfaction provided by the products based on the consideration of basic functionality and the satisfaction of usage. This further suggests that users no longer place their focus solely on needs, but also emphasize their desired, which complies with the theory of Norman (2004), who contended that the satisfaction of desire can better facilitate the success of a product than that of needs. And consistent with presented by Weinschenk (2010) that products are easier-to-use when the product's conceptual model resonates with the user's mental model.

This study used the concepts within reminiscence therapy to develop a smart photo album in order to improve the elderly memories and ability to feel happiness. The user-centered design focused on care for the elderly to accomplish the conceptual design. Observation and interviews were first conducted to explore the needs and ideas of the elderly for photographs (the discover step). Next, the critical factors for design were analyzed and defined (the define step). Finally, the scenario story was used to generate rich and innovative conceptual designs and to integrate new technologies (the develop step).

- **The discover step:** observation interviews were first conducted to explore the needs and ideas the elderly had regarding photographs. Six elderly over the age of 65 were interviewed in this study. Three of the participants were male and three were female, and their average age was 74.8. Table 1 shows the participants' basic information. The participants were asked to provide five of their favorite photographs and describe their memories, thoughts, and feelings regarding the content of each picture. Meanwhile, the emotions and expressions of the participants were observed. The interview time was approximately 1.5 h and the content was recorded as five categories: A(Activities), E(Environments), I(Interactions), O(Objects), and U(Users).
- **The define step:** the key factors for design were analyzed and defined. The collected qualitative data was written on individual post-it notes. Then, bottom-up inductive and axial coding to cluster similar concepts into a concept group, forming the aforementioned affinity factors. Coding is an operation process that first decomposes and conceptualizes data, and then reconstructs the concepts using alternative novel methods. Through coding, complex theories can be grouped and classified (Strauss and Corbin 1990). Subsequently, the affinity diagram method proposed in the book authored by Young (2008), *Mental Models: Aligning Design Strategy with Human Behavior*, was employed to extract the mental models of the research subjects. Young elaborated that mental models is a tool that can establish intangible thinking patterns using organized frameworks and present these patterns using visual lists or tables. Thus, affinity can effectively compile complex data and systematically present the current important clues and areas of interest regarding the photo memories of the elderly.
- **The develop step:** according to the results of the discover step and the define step, converted into design criteria. And then used scenario story to develop the conceptual design of a smart photo album. Scenario story are fictional stories, with characters, events, products and environments. They allow us to explore product ideas and key themes in the context of a realistic future. The most typical example are ID TWO design company and Richardson Smith design company, together for Fuji Xerox to develop photocopiers panel design. More successful cases proved that whether it is to create a simple children's toys, or the development of e-commerce have a good effect (Kelley et al. 2001).

**Table 1.** Profile of participants

No	Title	Sex	Age	Occupation	Living conditions	Symptoms	Characteristics
A	Mr. Lee	M	83	Barber	Live alone, son and daughter live nearby	Hypertension, Heart disease, gout	Opening at eight am, closing at seven pm; sometimes dizziness uncomfortable; drinking tea; reading newspapers and chatting with the elderly neighbor; three meals a day to take care of himself; occasionally sing karaoke OK
B	Mr. Liu	M	77	Farmer	Live with family	Stomach	Plowing in the morning, drinking tea, chatting and playing chess in the afternoon
C	Mr. Chen	M	65	Worker	Live with family	Diabetes	55 years old had diabetes, change eating potato, easily swollen limbs, wound difficult to heal, can not long standing and walking
D	Ms. Pan	F	75	Housekeeper	Live with family	Lumbar	Get up early, go walking and stretching exercises in the morning
E	Ms. Cheng	F	85	Housekeeper	Live alone	Foot arthritis	About 70 years old with his family eat vegetarian, now the knees more and more weak rarely go out
F	Ms. Chiang	F	67	Housekeeper	Live with family	Foot arthritis, presbyopia	Optimistic personality, bad memory, long-term medication

### 3 Data Analysis and Concept Design

#### 3.1 Data Analysis

First, we used AEIOU to record the thoughts and feelings of six elderly on the photo. The result was shown in Fig. 1. The participants pointed to the photo and excited about the interesting story:

*I like seeing pictures of myself together with my family, but before cameras were expensive, so we didn't take that many pictures (A06). I don't like taking pictures because I don't have anything nice to wear (B11). This was taken at your uncle's wedding (C09). They all look so similar; I forget who is who (D21). This is my eldest grandson; he's so cute; he's much more handsome now, but I don't have a more recent picture (E13). This is the house I grew up in; the bathroom was built so far from the house (F04). This picture was taken when I was in the army (F08) ...*



Fig. 1. Data collation using the AEIOU

Then, affinity diagramming was then used; the collected qualitative data was written on individual post-it notes for two rounds of categorization and coding. Finally, we founded 4 affinity factors relating to the mental ideals of the elderly. Memories (k1): seeing the photos of people, things, objects and places, can evoke a lot of memories (evoke memories), but some memories are fuzzy (vague memories). Sharing (k2): sharing happy story on photo, and enthusiastically introduced their families. Emotion (k3): think of the good things in past, feel happy (good mood). Think of the dead relatives or dislike the man, felt sad (sad mood). Lack (k4): at that time lack of resources (lack of resources), a rare opportunity or occasion can take pictures. Because the old photos lack, many scenes don't remember.

The collected data were organized and coded based on the affinity diagram proposed by Young (2008). The results obtained during the context observation process were compiled and converged, transforming abstract thinking patterns into physical solutions. Then, the mental models of senior citizens were compiled into lists and tables using a visualization method, as shown in Fig. 2.

The sorted categories clearly highlight important clues and areas of interest regarding the photo memories of the elderly. The results in Fig. 2 point out that photographs give importance to "Memories", "Sharing" and "Emotion" for the elderly. And, for over 65 years of age the elderly, because of the "Lack" of resources, each photograph for they more have a special significance.

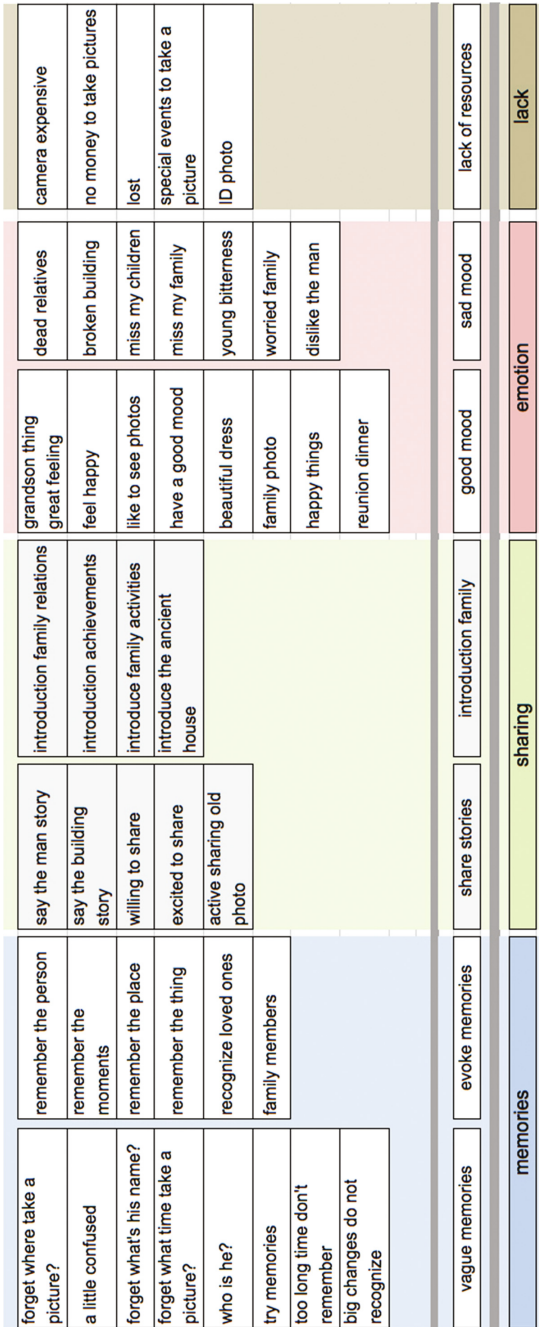


Fig. 2. Affinity diagramming of the elderly' memories

### 3.2 Concept Design

After the above analysis, in line with the needs of the elderly’s smart photo album, should have a “Memories”, “Sharing” and “Emotion” design standards. And meet their expectations of “love and care” needs. Then, we used scenario story to create rich and innovative conceptual design.

- **Characters mapping:** the role sets to 73 years old Lee grandmother. She is easy anxious; has hypertension and high blood sugar; currently lives alone; her son and grandson come back to eat and chat on holiday; knees more and more weak; poor memory and often forgot something; the spirit is not good and sleep at night poor; feel boring; watching TV during day and night.
- **Storyboards:** Lee grandmother lives alone. Before her grandson goes to the elementary school, she takes care the grandson single-handedly and they are very close. But now only on holiday, son with grandson come back to eat and to chat. Weekday life becomes very boring. When she misses grandson, she always looks at the old photos. Do not know what they are doing now? How high? How weight? Will not be bullied by someone? Thinking about the mood more and more depressed. I hope now I can listen to the voice of the grandson and see his smile.
- **Design concept:** The smart photo album was named Fond Memories. The elderly can stay updated on family events by simply flipping through the album of family pictures and real-time messages; they can also record voice or write messages to communicate with their families; smart photo album can automatically play the children’s choice of music for them; The lens on the album can detect and record their emotions experienced, therefor the family members can immediately understand and care. These shared memories create empathy, relieve depression, and allow the elderly to enjoy memories with their families. The sketch design was shown in Fig. 3.



Fig. 3. Sketch design

Then, the modified conceptual design is shown in Fig. 4. The advantages of smart photo album: (1) To provide a dedicated image communication platform. (2) The traditional way to flip the page, don't need to learn. (3) One-touch operation. (4) Any time with family, don't feel alone. (5) Image stimulation to enhance memory.



Fig. 4. Fond Memories concept design

The ICT technologies include: mobile device App development technology, cloud storage technology, wireless communication technology, community network technology, flip-flop device technology, music recommendation technology and emotion-awareness technology. Figure 5 illustrates the architecture of Fond Memories. Table 2 presents the scenarios for using Fond Memories.

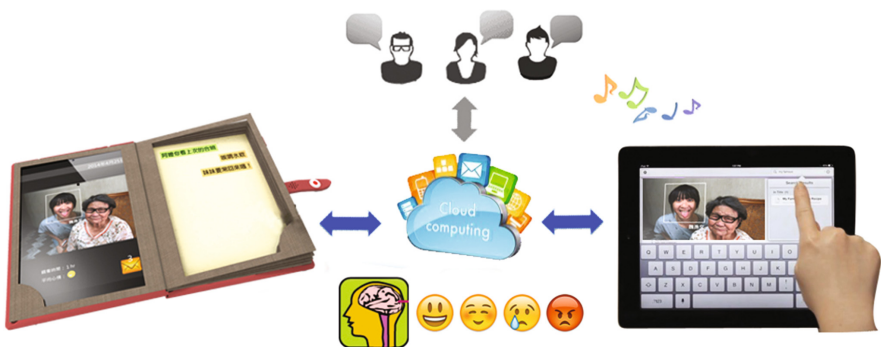


Fig. 5. The architecture of Fond Memories

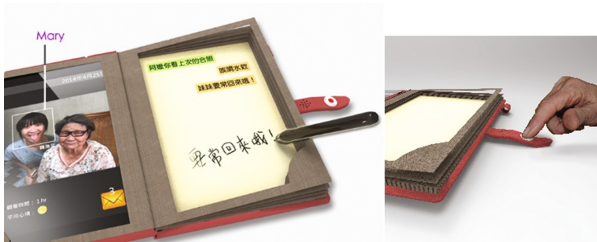


**Table 2.** The scenarios for using Fond Memories

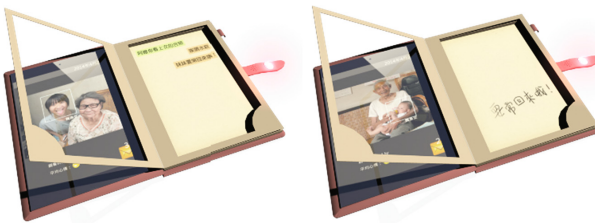
Scenario & Description



Family members can use mobile devices to access the cloud photo management system to add, delete, manage, and respond to messages. When a new picture is added, a light on the album will flash and notification sound will play. The elderly can simply turn the pages to view pictures and leave messages.



Name labels for those pictured can deepen the elderly' impressions of their families. Messages for each picture can be recorded or hand written in this platform for family interaction.



The pictures shown on the screen along with the corresponding information and messages change as the pages are turned.

*(continued)*

**Table 2.** (continued)

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Scenario & Description

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The lens on the album can detect and record their emotions experienced and give music suggestions, increasing the feeling of happiness felt when viewing pictures. Family members are automatically notified when the elderly feel melancholy.

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- Mobile device App development: the family members can manage the cloud album through the mobile App, set music, set people name labels.
- Cloud storage: save photos, sound and messages, and keep in sync with mobile device and smartphone.
- Wireless communication: use Wi-Fi or Bluetooth to communicate with the cloud.
- Community network: to establishment family network of community, to enhance the elderly and their families to share and interaction.
- Flip sensor: combined with electronic paper sensor technology, the photos and information is real-time updated when flip left and right page.
- Emotional Sensing: records the mood of the elderly when they are viewing the album and sends a message to inform the family.

## 4 Conclusion

The process of recording, remembering, and sharing photos can improve older adults' willingness to interact with others and provide them with means to recall, discuss, and share past experiences in order to improve confidence and self-esteem, relieve depression, and prevent mental and memory degradation. Families can use this shared platform to archive mutual feelings and memories. Each time these image memories are recalled and shared shortens the time interval between the event and the present and improves interactions and relationships between older adults and their families.

In this study the smart photo album presented two features: "Image memory sharing" and "Emotion detection".

1. **Image memory sharing:** The concepts within reminiscence therapy allow family members and the elderly to collect and record shared memories so that the elderly can improve their verbal expression, interpersonal interaction, memory reinforcement, and emotional state.
2. **Emotional detection:** the elderly's emotional responses are often carelessly overlooked and forgotten and minor changes in their emotions are difficult to distinguish. The elderly frequently do not know how to express their feelings and needs; thus, the lens on the smart photo album can be used to measure the emotional responses of the elderly so that family members are more able to provide care and communicative support

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