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Author	林, 詩樺(Lin, Shih-Hua) 大川, 恵子(Okawa, Keiko)
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Master's Thesis  
Academic Year 2020

FamiCloud: An Interactive Storytelling Media to  
Enhance Bonding of Intergeneration



Keio University  
Graduate School of Media Design

Lin Shih-Hua

A Master's Thesis  
submitted to Keio University Graduate School of Media Design  
in partial fulfillment of the requirements for the degree of  
Master of Media Design

Lin Shih-Hua

Master's Thesis Advisory Committee:

Professor Keiko Okawa	(Main Research Supervisor)
Professor Masa Inakage	(Sub Research Supervisor)

Master's Thesis Review Committee:

Professor Keiko Okawa	(Chair)
Professor Masa Inakage	(Co-Reviewer)
Senior Assistant Professor Junichi Yamaoka	(Co-Reviewer)

Abstract of Master's Thesis of Academic Year 2020

# FamiCloud: An Interactive Storytelling Media to Enhance Bonding of Intergeneration

Category: Design

## Summary

Super-aging society, which is caused by decline in fertility and mortality rates, has been one of the most discussed global phenomenon. The main focus of this research is on population of elderly, mainly solitary elderly who feel disconnected with their family, especially their grandchildren, who more often lose connection with their grandparents as a result of environmental barrier, cultural barrier, language barrier, technology advancement, and so on. Due to the fact, children nowadays have difficulties in developing close relationship with their grandparents, who grew up in dissimilar background and usually live in a separate city. As a consequence, majority children nowadays have infrequent contact with their grandparents, resulting in lack of understanding between each other due to lack of interactions and conversation topics.

This research proposes an interactive platform named FamiCloud to facilitate family history learning, moreover to assist conversation and enhance bonding between intergeneration. As a result from observations, interviews and surveys, it is proven that preserving and sharing family history with the use of FamiCloud can strengthen bonding of family members through enhancing knowledge of family history and encouraging further interactions as a 'conversation bridge'.

## Keywords:

Family History, Storytelling, Memento, Intergenerational Communication, Reminiscence, Aging Society

Keio University Graduate School of Media Design

Lin Shih-Hua

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# Chapter 1

## Introduction

The focus of this research is on the issue of population aging, mainly on solitary elderly who are lonely due to disconnection with society or their family. This research aims to enhance bonding of intergeneration, especially grandparents-grandchildren relationship in Taiwan, through preserving and sharing family history, and moreover to reduce loneliness of solitary elders while to increase grandchildren's knowledge about older generations in their families.

### 1.1. Aging Population

Aging Population, which is mainly driven by declining in fertility (economic recession results in unwillingness to give birth), and inclining in longevity (increases in life expectancy due to advancement of technology), has been a global phenomenon for years. The world's aging population, meaning the proportion of elderly, is continuously increasing. According to United Nations<sup>1</sup>, in 2018 the global population of elderly aged 65 or older exceeded number of children aged 5 years or younger. The data from *World Population Prospects: the 2019 Revision* states that by 2050 one in six people in the world will be over 65 years old, which is a dramatically increase of 7% from one in eleven in 2019. [1]

The rapid increase of aging population is not only impacting high-income countries such as Japan and United States, but is also affecting low and middle-income countries such as Chile and Russia. [2] In order to track global aging, a method

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<sup>1</sup> <https://www.un.org/en/about-un/>

called “ Aging Index ”<sup>2</sup> is applied to measure aging population. It is calculated by total number of elders aged 65 or above divided by people under age of 15 in a specific population, that is, the higher the aging index means the higher proportion of elders in a country. By calculating Aging Index, it is revealed that the situation of aging population is especially significant in developed countries, with the average aging index of 106% in 2015 ranking from the highest in Japan (200%), follow by Germany (162%), Canada (100%), France (95%), and so on. As for the focal country of this research - Taiwan, with the population of around 23.5 million, the aging index was 92% [3], which is indeed not the highest among developed countries, but the rate is inevitably increasing and reached 105.7% at the end of 2017. [4] Since 1900s, the population of children and young adults in Taiwan has been continuously decreasing while the population of elderly increases at a speedy rate (Figure1.1). [5]

To further measure population aging in a country, World Health Organization has determined degree of population aging into different categories: A society in which the proportion of people aged 65 year old or above accounts for 7% of a country ’ s population or higher, is known as “ Aging Society ”, 14% or above is called “ Aged Society ”, 20% or higher is regarded as “ Super-Aged Society ”. [5] In 1993, Taiwan entered “ aging society ” with elderly accounts for 7% of population in Taiwan (Figure 1.2). In 2019, the percentage of elderly population increased to 14.04% (in which 12.01% are solitary elders), making Taiwan an “ aged society ”. By 2025, Taiwan is estimated to have more than 20% of elderly population, making Taiwan a “ super-aged ” society, where one in every five people in Taiwan will be elderly aged 65 or above. [3]

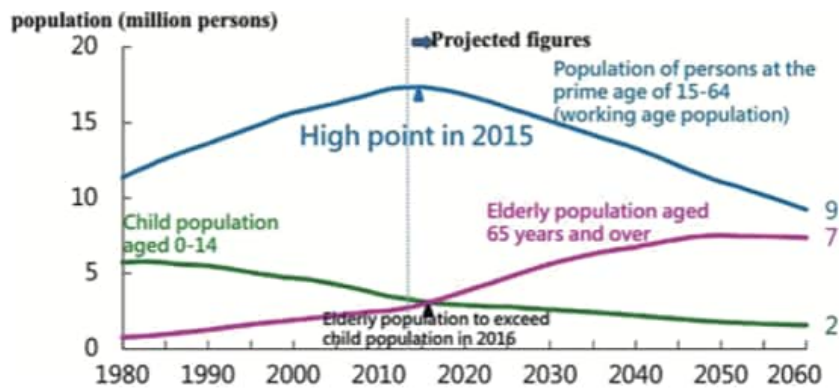
The global phenomenon of population aging has led to rapid increase of solitary elderly who live alone due to death of spouse and/or disconnection with family members. According to data published by United Nations Department of Economic and Social Affairs<sup>3</sup> in April 2019, about one in five elderly in Europe and Northern America live alone, whereas lower proportions of elderly living alone are

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2 <https://www.pordata.pt/en/Europe/Ageing+index-1609>

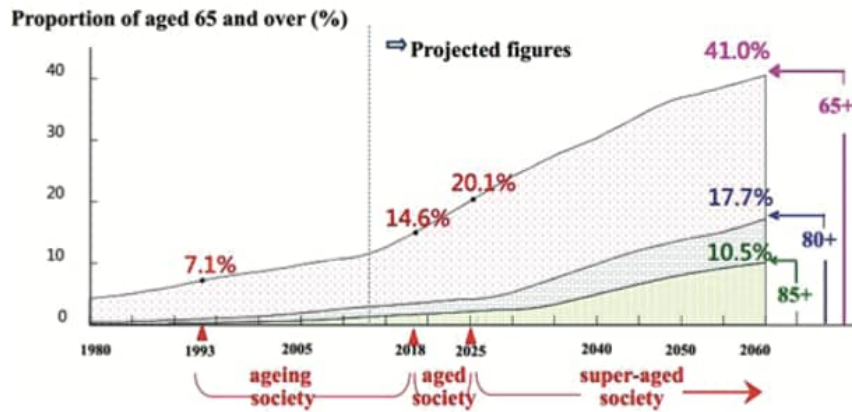
3 <https://www.un.org/development/desa/en/>

found in African and Asian countries; however, the increasing population of solitary elderly throughout the world is undeniably significant. Apart from this, the data also states an interesting fact that women are more likely to live alone than man due to three reasons: 1) higher life expectancy of women; 2) higher prevalence of widowhood among women; 3) higher prevalence of remarriage among men after widowhood or divorce. [6]



(Source: The OXFORD University Press [5])

Figure 1.1 Population of Taiwan in 3 Age Groups



(Source: The OXFORD University Press [5])

Figure 1.2 Elderly Population in Taiwan

## 1.2. Intergenerational Disconnect in Taiwan

As mentioned, in recent years, there is increasing number of adults who do not have children, meaning that there are fewer family members who can take care of them and accompany them both physically and mentally as they become seniors. Despite those having children or even grandchildren, many are living alone. Majority of these solitary elders feel lonely because they are facing social isolation, not only from the society outside, but also within their family. However, this does not signify the family intentionally disconnect with these elderly, but rather due to responsibility overload as children enter adulthood, resulting in infrequent contact with family members, especially their grandparents. The disconnection between elderly and their grandchildren makes it difficult for them to develop close relationship with each other, resulting in loss of family history and identity if the story is not shared. However, even if the story is shared, by just verbally telling the story, it can be forgotten easily and is hard to imagine.

The issue of intergenerational disconnect also occurs in Taiwan. Taiwan has a culture of typical traditional value of filial piety, in which youngers take responsibility of elders in home; however the elders also have strong willingness to offer substantial childcare to their grandchildren, which makes Taiwan has the culture of grandparent caregiving. Due to the fact, majority of families regard caring of grandchildren from their grandparents as an obligation. Child care provided by grandparents covers various contexts both physically and mentally. Some instances of physical supports include taking grandchildren to school and picking them up when class is over, or making meals and doing the laundry or cleaning up the rooms for them. Some examples of mental supports include taking an active interest in grandchildren's everyday life and sitting on couch watching television together as companion.

At early stage of life, majority of the children are raised by their grandparents during early-middle childhood (age of 11 or before junior high school), live with parents during adolescence (age of 11-18), and move out from home when they enter early adulthood stage (age of 18 and above) to pursue education in university or to pursue their careers. For families that do not live together with elderly in the same house, the typical arrangements for child care provided by grandparents

are baby-sitting over the weekend, looking after children when their parents are at work, or taking care of grandchildren under other circumstances on a regular or irregular basis. On the other hand, some parents do live together with their parents, where the grandparents are giving child care daily from morning to night due to parents' extensive full-time employments resulting from social pressure that requires work from both parents in order to maintain or improve living standard. This reflects parents' need for their own parents' assistance in taking care of grandchildren in the changing society.

Despite living together with grandparents, or being taken care of by grandparents during childhood, the grandparents-grandchildren relationship, including their values and behaviors, has been largely influenced for decades due to social change. In the modern society, individuals in a family are more individualistic-led in their behaviors, resulting in negative impacts on family communications and interactions. The following discussion will focus on environmental distance and linguistic distance, and the impacts these factors have on the intergenerational relationships, especially between grandparents and grandchildren.

### **1.2.1 Environmental Distance**

The environment where each of us live in, has built up the way we think and behave in our everyday lives. The dissimilar thinking and behaviors of people of same generation determine the closeness of their relationship, which with no doubt, also have impact on the relationship of intergeneration. Considering grandparents at age of 65 or above, their childhood period took place around mid-1900s, where the living conditions and surroundings are completely different to the environment that their grandchildren live in. Children nowadays are living in a world that is constantly changing, where their mind and thinking are related to the whole country and the outside world. However, their grandparents' youth was restricted to their family and surrounding neighborhood.

The disparate lifestyles between grandparents and grandchildren are resulting from the following factors:



### **Agriculture/Industrialization**

In 1904, the first year of reconstruction of Taiwan, the top three land cover classes were forest(60%), agricultural land(23%), and grassland(12%). Agriculture has been an important sector of Taiwan's economy since centuries ago when people had to fish, hunt, and grow crops for living. In 1895, Taiwan occupied 3,506 km<sup>2</sup> of cultivated land, and the agricultural land increased from 23% in 1904 to 34% in 1956. [7]

In late 1940s, Taiwan experienced rapid economic growth and industrialization. In 1963, the output value of industrial sectors exceeded agricultural sectors, which made Taiwanese government to shifted their priority from agriculture to labor intensive industry such as textiles and convenience food. Hence in 1970s, agriculture shifted from primary focus of economy to a supporting role, and lands were mainly used for local urbanization and industrialization purposes. As a result, the society of Taiwan was transformed from a relatively impoverished agrarian society to a relatively abundant industrial and export-oriented economy. [8]

Elderly, or our grandparents, have been through both agricultural and industrial period of society change, where their livings were heavily relied upon farming or manufacturing. The grandparents grew up in poverty, that day by day, they had to leave home before sunrise and come home in the late evening to work at farmland or factory in order to earn a few dollars that could hardly feed the whole family. Majority of families in past are extremely poor that the families lived in hunger because they could only afford insufficient amount of crops or food for meals. For instance, the extremely poor families had no choice but to share one small bread with all families members, whereas families with marginally better condition would have rice covered with soy sauce for daily meals.

In contrast to our grandparents who used to live in difficult conditions, people nowadays are born to live in urban society with well-developed infrastructures and industries. Families today have stable incomes and are able to afford quality meals as well as they are willing to spend money on entertainment in addition to living essentials, resulting in insatiable demand for goods gratification among young generation. The disparate living environment results in dissimilar values between older generations and young generations, and has become one of the major factors

that overshadowed grandparents-grandchildren relationship in modern society.

### **Technology**

Our grandparents grew up in a society with no technology. Their lives were rough and difficult because all works had to be done without any modern tools. For examples, in old times, our grandparents had to use wood-burning fire to cook, or using rutted stone slabs as washboards to do laundry, which is very time consuming and required a lot of energy. Moreover, the transportation was so much different in past. In our grandparents' youth, besides commuting on foot, the most common transportation was bicycle, which was introduced from Japan in 1889. The Human-powered tricycle was later introduced and become a popular commute tool after 1950s, until 1960 when automobile taxi and bus replaced traditional transportation. [9] In addition to transportation, our grandparents youth was simple and very limited to certain entertainment such as radio or black and white television, but majority of families could not afford these electronics; rather, they spent time with nature on the mountain or by river. Their daily lives were restricted to their neighborhood and people living around them.

In contrast to our grandparents who grew up in underdeveloped society, children nowadays have access to wide variety of electronic devices. Technology advancement has brought convenience to our everyday lives. Washing machines, rice cookers, smartphones, express trains, and airplanes, all of these allow us work more effectively and efficiently, and have provided us a method to communicate with people across countries and transport us to anywhere in the world. Nevertheless, with the advancement in technology, people today have wide social circles around the world, and they have more pressure in living because their schedules are occupied with jobs, schools, activities, and so on. As a consequence, it became very difficult for elder generation and young generation to communicate with each other because their lifestyles are extremely different and do not have sufficient time for each other, resulting in lack of communication and interaction between grandparents and grandchildren in modern society.

### 1.2.2 Linguistic Distance

Taiwanese <sup>4</sup> (also known as Southern Min or Hokkien) was originally from Fujian in China, and was the primary language of people in Taiwan until 1940s when Mandarin Chinese was promoted as the national language. However, to preserve and maintain mother-tongue of Taiwan, elementary schools throughout Taiwan started offering Taiwanese language courses since 2001. [10] Taiwanese is one of the mandatory courses among elementary schools where students have to participate a one-hour Taiwanese language class for weekly basis. Nonetheless, the one-hour per week mandatory course does not encourage people to utilize Taiwanese in their daily lives, or they do not have opportunity to practice and use the language outside of classroom. According to a research named *Language Spoken at Home* conducted by Professor Ye Gao-Hua at National Sun Yat-Sen University of Taiwan, for elderly who were born before 1945, 71.4% of them can speak Taiwanese, 12.3% can speak Mandarin, and only 5.7% can speak both languages. In contrast, for people who were born between 1986 and 1994, only 22.3% can speak Taiwanese, 57.3% speak Mandarin, and only 19.1% are able to speak both languages. Another survey was done by Professor Zhang Xue-Qian from Taitung University in 2017 to investigate how elementary schoolers and middle schoolers consider the fluency of their Taiwanese language ability. As the result states, only 22.41% considered their Taiwanese listening ability as proficient, and only 16.84% considered their Taiwanese speaking ability as fluent. [11] From these studies, it is undeniable that the usage of Taiwanese language has constantly decreasing in younger generations. Taiwan has faced a language shift from Taiwanese language to Mandarin Chinese.

Thus, the language shift in Taiwan has made it very difficult for elderly in Taiwan to communication with young generations. Although children from Southern part of Taiwan are more fluent in Taiwanese, but children in Northern part of Taiwan, including the capital city - Taipei, only have limited ability to communicate in Taiwanese, meaning it is nearly impossible for them to develop deep conversation with their grandparents who are not as fluent in Mandarin Chinese. The inability to communicate fluently in common language often cause miscommuni-

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<sup>4</sup> [https://en.wikipedia.org/wiki/Taiwanese\\_Hokkien](https://en.wikipedia.org/wiki/Taiwanese_Hokkien)

cation between grandparents and grandchildren, resulting in infrequent communication between the two generations, and grandchildren' unwillingness to further interact and communicate with their grandparents.

### 1.3. Research Objective

The objective of this research is to strengthen distant intergenerational relationship, especially grandparents-grandchildren, through preserving and sharing family history and to further enhance story learning experience through 'realization' of antiques; moreover to cure loneliness of elderly while to increase children's knowledge about family history. Based on the research objective, the following research questions are formulated:

(1) *"How to effectively preserve family history as a mean to cope with family estrangement to strengthen intergenerational relationship, especially for distant grandparents-grandchildren relationship?"*

(2) *"What are effective approaches to enhance understanding of stories between disparate generations who grew up in dissimilar environments?"*

### 1.4. Contribution

The three main contributions of this research are as below:

- Creation of a platform that allows preservation and sharing of family history to enhance intergenerational relationship while serving as a 'conversation bridge' for distant family members.
- The design of this research does not only aim to enhance intergenerational relationship, but the process of engaging in the platform could reduce loneliness of solitary elders and at the same time increase young generations' knowledge about their families as a whole while preserving family identity.
- Utilization of engagement-driven elements to encourage long-term interaction and engagement of all family members.

## 1.5. Thesis Structure

Chapter 2: Literature reviews on family history, reminiscence, communication, and storytelling.

Chapter 3: Discussion on overall design concept of FamiCloud.

Chapter 4: Evaluation on usability of FamiCloud and effects on intergeneration.

Chapter 5: Conclusion, research limitation, and possible improvement.

# Chapter 2

## Literature Reviews

This chapter consists of major themes that are considered and reviewed for identification and design of this research. The following topics will be discussed:

- Family history

Discuss the importance of family history and benefits it brings to individuals.

- Reminiscence and mementos

Discuss the importance and impact that reminiscence provides to individuals' lives, as well as its connection with use of mementos.

- Communication and relationship

Discuss the importance of communication and how it affects relationship between individuals.

- Storytelling

Discuss the importance of storytelling and how it strengthens bonding of individuals.

### 2.1. Family History

In this research, family history is selected as a mean to enhance bonding of intergeneration, especially grandparents-grandchildren relationship. Through preserving and sharing family stories, solitary elders who are lonely and disconnected with society and even their family could regain confidence and create sense of

bond with their family. Meanwhile, the younger generation could deepen understanding of themselves as well as the family as a whole by learning their family history as a method of preserving and handing down family identity. Further benefits of family history will be discussed as below.

### 2.1.1 Importance of Family History

In general, family history is usually lost in three generations if it is not preserved or passed down. People usually are able to recall marginal or abundant information or stories about their grandparents, but barely know anything about their great-grandparents because the stories are never shared to them or are not being preserved. [12] Our older generations are usually the ones that bring structure and unity to family as a whole; therefore, passing down family history from one generation to another is essential. Family history normally conveys information about experiences of our ancestors, the generational relationships of all members, as well as represents the family themes. The genealogical aspect of family stories provide historical outline of family tree across all generations, in which the family traditions are passed down to younger generations through the bonds of family members and family heritages.

Family history is essentially important because it gives people undeniable power and strength in life, and can bring all generations close together. Family history also allows people to define who they are as an individual and as a member of a society. Moreover, the recent studies have stated that children who have more knowledge about their family history tend to show greater emotional resilience and are able to face challenge more effectively because they have stronger sense of who they truly are and where they actually come from. [12]

In summary, family history is undeniably an essential part of our lives that conveys supportive aspect both spiritually and emotionally to our growth. It is important that it connects all generations together, offers comfort and security, moreover provides source of identity of ourselves, strengthens family bond, and teaches us values in life. Thus, individuals should have knowledge of their family history to truly deepen their understanding of family members, which could be an effective method to enhance and strengthen family bond.

### 2.1.2 Related Work

Family story is important that it should be preserved and carried through generations. Whether it is a small event that occurred in our lives or a big event such as marriage that only occurs once in life time, all of these stories are the identity of who we are and have built up the root of our family tree to create precious values in each of our lives. There has been wide variety of media or tools designed to facilitate families to share stories with their family members to pass down family history to all generations.

For instance, “FamilySearch<sup>1</sup>” (Figure 2.1), a nonprofit family history organization that was founded in Utah, United States in 1894, aims to connect families across generations worldwide by offering users the platform to preserve family stories in forms of audios, videos, photographs, and texts. [13] Another website called “MyHeritage<sup>2</sup>” (Figure 2.2), which was founded in 2003 in Israel, is also an online genealogy platform for people all around the world. MyHeritage also allows users to preserve their heritage online; however, MyHeritage provides genealogy search where users can upload their DNA results to the website to connect and reunite with their lost family members. [14] These are the two examples of intangible works created for sharing of family histories; however, these websites do not encourage any interactions and engagement among family members. In addition to online platforms, some tangible tools are also designed to help sharing of family history. For instance, board game such as “Family Tree – the entertaining board genealogy<sup>3</sup>” (Figure 2.3), is used as facilitating tools to guide story sharing among family members. In this board game, players need to make up the family tree while learning Russian history and the lifestyles of different generations. However, board game is restricted to certain number of family members, requires gathering of family members, and does not allow preservation of family stories.

By analyzing the advantages and disadvantages of the family history related works listed above, a media that contains the following key elements is considered

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1 <https://www.familysearch.org/en/>

2 <https://www.myheritage.com>

3 <https://boardgamegeek.com/boardgame/153617/semejnoe-drevo>



for this research: 1) allow preserving and sharing of family history; 2) encourage long-term interaction and engagement of family members; 3) utilizable both when family members are apart or together



(Source: FamilySearch [13])

Figure 2.1 FamilySearch



(Source: MyHeritage [14])

Figure 2.2 MyHeritage



(Source: BoardGameGeek [15])

Figure 2.3 Board Game: Family Tree

## 2.2. Reminiscence

Since this research focuses on the use of family history as key to enhance bonding of intergeneration who may have difficulty imaging and understanding objects and environment of dissimilar period, the process of reminiscing is very important. In order to success reminiscing process, the use of memento is essential. It is not only powerful in retrieving memories, especially for older generations, but also effective for enhancing understanding across generations.

### 2.2.1 Power of Reminiscence

Reminiscing, or recalling past events, is a process that people of all ages spontaneously or purposively perform in their everyday lives. Reminiscence can be recalling people, events, or even feelings. It is a valuable activity that serves to maintain relationship between people, to make sense of the present life, and to assist people telling consistent stories about themselves. [16]

Reminiscence can occur as soon as a child begins to remember things. The ratio on amount of time or attention given to a person 's past compared to the future changes systematically, with an continuous increase of past to future ratio as a child grows up and the ratio would exceed when reaching elderly stage of life. [17] That means, the older one becomes, the more frequent one would conduct reminiscence activity. Although reminiscence occurs in people of all ages, it is more often associated with the elderly. Reminiscence has been commonly applied to elderly as a therapy, known as Reminiscence Therapy, which is proven to have significant impacts on improving elders' comprehension skills, enhancing their self-esteem, and ease their feelings of depression and loneliness. Furthermore, reminiscence is highly associated with health, pleasure, security, and sense of belonging to a location. Whether it is recalling positive memories or negative memories, both are creating profound impacts on the psychological well-being among elderly. [18]

#### **Six Types of Reminiscences:**

Reminiscence can be classified into six different categories: integrative, instrumental, transmissive, escapist, obsessive, and narrative.

### Integrative Reminiscence

To increase self-esteem, self-understanding, personal meaning, and life satisfaction through the process of reviewing one ' s past. [19]

### Instrumental Reminiscence

To recollect past plans, goal-directed activities and the attainment of goals, or the past attempts to overcome difficulties, and drawing from these past experience to solve present problems. [19]

### Transmissive Reminiscence

To pass on one ' s cultural heritage and personal legacy while to teach values and provide meaning and purpose of life to oneself and others.

Study has found that storytelling reminiscence has positive effect on adaptation because it provides valuable social function in terms of oral history and can enhance self-esteem. [19]

### Escapist Reminiscence

To glorify the past and deprecate the present, or in other words, to overstate past achievements and to exaggerate past enjoyments by revealing a desire to return to the good old times, but is not truly as pleasant as in reality. [19]

### Obsessive Reminiscence

To indicate failure in past. This type of reminiscence could further lead to depression and mental illness, or even suicide. [19]

### Narrative Reminiscence

A descriptive recollection of the past. To provide biographical information such as date and place, and to recount past events. [19]

## **2.2.2 Mementos**

Reminiscence can occur through two broad methods – the Oral Reminiscence, or the Silent Reminiscence. Oral reminiscence is done by asking one to talk about his past, such as his childhood memory or his accomplishment in the past.

Oral reminiscence is usually processed purposively and with accompany. On the other hand, silent reminiscence can occur either when one is alone or with a group of people, without being questioned. For instance, seeing your wife wearing same dress she worn on your first date 20 years ago might retrieve memory of what happened on the day. [17] Whether through oral or silent, most of the time reminiscence is done with assistance of mementos, which is defined as objects given or deliberately kept as reminders of a person, a place, or an event. Mementos can be classified into physical mementos or digital mementos. Examples of physical mementos include a photo album, a wedding ring, a card, or a cloth that was worn by deceased grandparent. Digital mementos can be a song, a digital photo, a video, or a voice message. All of these mementos are representing a person 's life journey, and are effective in recalling vivid memories from past and carry through generations.

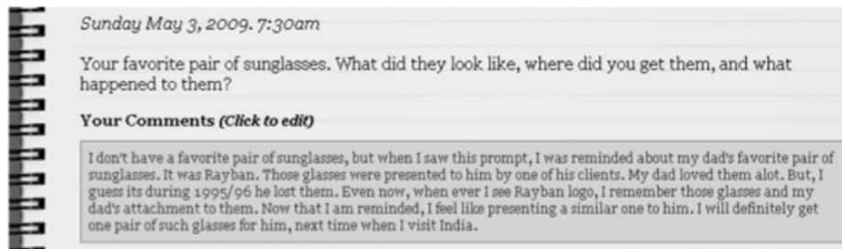
### 2.2.3 Related Work

Many works have been done to enhance memory recalling process with the use of memento for story building. One instance is “ Pensieve<sup>4</sup> ”, which is designed by researchers from the Information Science Department at Cornell University to support reminiscence. Pensieve is a system that gives spontaneous and serendipitous supports in people 's everyday reminiscence by emailing memory triggers that contain either social media contents they previously created on third-party websites or text prompts about common life experiences (Figure 2.4). To trigger more memories, variety of medias such as photos, music, and texts were also utilized in the system (Figure 2.5). The users can see triggers sent by Pensieve and respond by writing stories extracted by the triggers given. The research was conducted among 91 users for five months period. The results showed that Pensieve was a successful design to support everyday reminiscence. Moreover, the results also shows that even when the users do not respond to Pensieve, they still perceived the memory trigger very valuable and effective because it reminds them about particular event which was powerful in boosting their emotion and memory. [16] The work, Pensieve, possesses profound impact in reminiscing one 's past, and

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<sup>4</sup> <https://dl.acm.org/doi/10.1145/1753326.1753635>

the appliance of mementos as supportive tools was successful in retrieving one's memory and is proven to be helpful for elaborating story contents in detail.



(Source: Pensieve [16])

Figure 2.4 Pensieve Memory Trigger I



(Source: Pensieve [16])

Figure 2.5 Pensieve Memory Trigger II

## 2.3. Communication

Communication is one of the cores of this research both for story sharing and learning process of family history, as well as one of the keys to evaluate bonding of family members. This section will discuss definition of successful communication and benefits of good communication for relationship building.

### 2.3.1 Power of Communication

Communication is a process of transferring information to produce greater understanding between two or more parties. However, the word ‘communication’ has very broad definition, that it can mean communication between computers, between animals, or between humans. In this context, we will focus on human communication. “Human communication is often interpreted as transmitted message in a conventional code like a language. However, communication requires a specialized interactive intelligence where the sender has to perform recipient design while receiver conduct intention recognition as a response back to the sender” [20], meaning there should be actions or responses going back and forth as continuous behaviors between sender and receiver.

Communication can be done verbally, through written media such as books, letters, and magazines, through visuals such as graphs and maps, or through non-verbal or body language including tone of voice, eye contact, and gestures. All of these communication methods are essentials skills both in personal life and business environment. Good communication skills can allow others and oneself to perceive information more quickly and precisely and will thus develop understanding between one other. On the other hand, poor communication could lead to misunderstanding and miscommunication. Since centuries ago, communication has been recognized as an essential skill for living and building relationships, and is still perceived as one of the most important life skills today. For instance, good communication skills is often required to succeed in careers. According to a LinkedIn survey<sup>5</sup> conducted in 2016 in the United States, communication was ranked the most important soft skill in business [21], not only because it can

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<sup>5</sup> <https://corporatefinanceinstitute.com/resources/careers/soft-skills/communication/>

enhance understand among employees, but a good communication skill can also help company to develop and build trust with its partners and clients.

### 2.3.2 Communication and Relationship

Good communication is known as the key to positive relationship. Communication model involves a sender, a receiver, and a verbal or non-verbal message that is encoded (transforming thoughts into communicable message) by the sender and decoded (interpreting the message) by the receiver. It should also include response or feedback from receiver to the sender 's message as a continuous behavior.

In communication, 'listening' is an essential skill to develop good communication and thus to maintain positive relationship with one another. Active listening is conducted when one is genuinely interested in the topic of another person. An active listening skill involves non-verbal communication (body gestures), attentiveness (making eye contact), avoid judgment, and tolerate silence (patience). Furthermore, how one responses to a message or information can also affect the relationship. According to Active Constructive Responding (ACR) Model, an active and constructive response requires eye contact and positive emotional expression, presents enthusiasm to the conversation topic, and is usually followed up with more questions or feedback going back and forth. [22] This type of response is the most effective in building positive relationship as one is showing enthusiasm and genuine interest to the conversation. This way, it can increase and sustain positive emotion of the other person whom would thus be more willing to have conversation again in future.

Communicate is an essential skill that everyone should obtain. It allows people to understand one another and to strengthen or to develop further relationship with each other. A healthy communication is needed not only among friends, significant other, or colleagues, but it is also essential among family members. Communication between family members is normally being neglected because people are sometimes being "too comfortable" with their family. They have no chance to learn about life of their family members, or they are too busy in their daily lives that they do not have time for conversation other than small talks. According to an article published by New York Times, people who spend more

time having deep conversations is happier than those who only engage in small talks. A psychologist from University of Arizona named Matthias Mehl states that substantive conversation is the key to happiness because people are driven to find and create meaning in their lives, plus people are all social animals who like to have sense of connection with other people. To prove his statement, Matthias Mehl conducted a test on 79 college students who were told to wear electronically activated recorder with microphone attached to their lapel to record a 30-second conversation they have every 12.5 minutes for 4 days. He then went through all the tapes and analyzed the result with students' self-reports about their satisfaction to their lives and happiness measures. The result shows that the happiest students have 45.9% of daily conversation as substantive conversation; whereas unhappiest students only have 21.8% of daily conversation as substantive conversation. In addition, small talks only account for 10% of happiest students' conversations and 28.3% of unhappiest students' conversations. [23] Thus, deep conversations over small talks is beneficial as it can boost and maintain one's mood.

Thus, to develop and maintain close relationship with one another, having good communication skill is not enough. One should also be able to have deep conversation in order to develop intimate relationship. Deep conversations can be a person's most honest opinion and true feeling toward a topic, such as grandparents' experience in war and how they felt during the event, or the story and meaning behind mementos that grandparents obtain. In this research, communication between family members, especially grandparents and grandchildren, with the use of family history as a mean, will be observed as the key to evaluate relationship between intergeneration.

### 2.3.3 Related Work

Many tangibles devices have been designed aiming to assist communication with grandparents who live distant from their families. For instance, researchers from University of Toronto, OCAD University, and Conestoga College collaborated together to design a device called "Families in Touch (FIT)<sup>6</sup>" (Figure

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<sup>6</sup> <https://dl.acm.org/doi/pdf/10.1145/2661334.2661375>



2.6). Families in Touch is a smart photo frame with system that focuses on asynchronous communication. When the elderly touches the frame, his or her family will receive an email indicating that the senior is thinking of them, then the family member can access to a website to respond with a video message which will be automatically sent to the smart frame for elderly to watch. Since this design does not allow seniors to interact other than touching the frame, another device called “InTouch<sup>7</sup>” (Figure 2.7) was created. In Touch is a tablet device with simple and easy-to-follow features allowing elderly to take video, photo, or record voice message to their family members with simple steps. [24] Another profound work is “Blossom<sup>8</sup>” (Figure 2.8), which is a tangible interface designed by researchers at Hong Kong University of Science and Technology. Blossom consists of two identical vases with flower and is connected to a device with family photos presenting. The usage scenario is that each vase will be placed at two different houses – one at grandparents’ home, another at the grandchildren’s. When the grandparents want to leave message to their grandchildren, they simply only need to roll the handle on the vase to record their voice message and press the button to send message to the other vase – the grandchildren’s house. When receiving new message, the flower will close up indicating there is unread message. If the grandchildren respond to the message, the flower will bloom again. However, if the grandchildren decide to ignore the message, the family photo on the device will start fading to warn that they are being disconnected with their grandparents as well as to give grandchildren sense of guilt for ignorance. [25] All these three designs have successfully assisted communication between intergeneration. However, these devices do not guarantee long term interaction and engagement both to the devices and families members, as well as may not be as assistive in enhancing relationship among family members with lack of conversation topics.

Through analyzing the works listed above, it is decided that in addition to elements listed in chapter 2.1.2, which are: 1) allow preserving and sharing of family history; 2) encourage long-term interaction and engagement of family members; 3) utilizable both when family members are apart or together, this research will

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7 <https://dl.acm.org/doi/pdf/10.1145/2661334.2661375>

8 <https://dl.acm.org/doi/pdf/10.1145/2996267.2996276>

also focus on creating a design that serves as a 'conversation bridge' to boost conversation between distant family members who are lacking conversation topics, especially grandparents and grandchildren who grow up in extremely dissimilar environment.



(Source: Families in Touch [24])

Figure 2.6 Families in Touch



(Source: In Touch [24])

Figure 2.7 In Touch



(Source: Blossom [25])

Figure 2.8 Blossom

## 2.4. Storytelling

Storytelling is important in this research for the preservation of family history. In the family history story collection process of this research, after reminiscing stories with the use of mementos, family members are expected convey their message or talk about their past in form of storytelling to grasp audience (in this case the family members) attention to seek further details of story contents. This section will discuss the importance of storytelling, effective storytelling methods, and its benefits to individuals and/or group.

### 2.4.1 Defining Storytelling

Storytelling is a traditional and powerful communication tool between people. It has been widely utilized in education, games, commercials, speeches, and so on. According to National Storytelling Network<sup>9</sup>, storytelling is a interactive art of using words and actions to reveal the elements and images of a story while encouraging the listener ' s imagination. While requiring a great extent of imagination from audiences, the method and tools utilized to convey story environment or atmosphere during storytelling is especially important. Some commonly used tools include videos, such as interview videos or animation videos. Other tools include photos or audio such as music are often used. A successful storytelling requires the following five key points: First, storytelling is interactive and involves two-way interaction between storyteller and audiences. Second, storytelling uses words – either vocal or sign languages. Third, storytelling uses actions such as vocalization, physical movement and/or gesture. Forth, storytelling presents a narrative story. Lastly, storytelling encourages active imagination of audiences while listening to the story. [26]

Although storytelling may seem like a modern activity, it has actually been practiced since ancient time. Some archaeologists and anthropologists stated that human minds have evolved with storytelling since centuries ago. When our ancestors evolved to live in groups, they made sense of increasingly complex social relationships with whole community by storytelling who they are and where they

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<sup>9</sup> <https://storynet.org>

come from. [27] It all began about a million years ago when our hominid ancestors began to control the use of fire, which seems to have a profound impact on the development of human beings. The use of fire provided sense of warmth and defense against predators and enhanced human 's ability to cook food, as well as brought human social bonding and togetherness in dark, which then gradually led to development of a common activity by fireside – the storytelling. [28]

### 2.4.2 Power of Stories

Some may wonder “*why is storytelling important?*” and “*why do we tell stories?*”. A Harvard University evolutionary psychologist named Steven Pinker stated that stories are important for learning and developing human relationship. Stories have a powerful and universal appeal that either telling stories or listening to stories are both the fundamental of social cognition, and they bring people together regardless of languages, religions, or ethnicities. [27] Stories can be created by individuals, groups, communities, cultures, or societies, and they work as a means to store and pass down myths, fairy tales, legends and history. These stories teach us values, teach us how to live and how to behave, as well as transform tacit knowledge between people in forms of virtual media. For instance, in a company, story creates the living memories of organization and keeps it alive. Stories form the corporate culture influence and co-create the basic principles of individuals and groups, as well as influence the quality of organizational learning. Furthermore, stories provide sense to things and events, and represent norms, experiences, and explanations of the present. The basic values of people and groups are projected into the stories, and are used to create personal and group identities, change social practices, and share knowledge and values to others. These stories also determine what we accept, how we see the world as a whole, and influence our response to future incentives. [29] Raymond A. Mar, an assistant professor of psychology at York University in Toronto stated that the best stories are the ones retold from generations to generations. These stories do not simply only present a believable picture, but they also captivate the audiences, whose emotion is completely tied with the characters and contents of the stories. [27] In this research, stories of family history – especially grandparents ' stories, will be collected and shared with the distant family members as a means to enhance intergenerational

bonding, especially grandparent-grandchildren relationship.

### 2.4.3 Related Work

Some works, both tangible and intangible, have been designed for enhancing story sharing and story learning of history. One instance is "Slot-Memento"<sup>10</sup> (Figure 2.9), which is designed by researchers from Department of Industrial Design at Eindhoven University of Technology in Netherlands, is a device to enhance story sharing for family members. Slot-Memento consists of a system with slot machine like design aiming for elderly to share their stories to young generations. This device functions of memento photo displaying, story recording, and preservation through use of flash drive. To use Slot-Memento, elderly simply needs to pull down the handle for memento photo to appear on screen, then presses the button to start recording stories related to the memento. For stories to be watched by others, the flash drive needs to be inserted into the device in advance. As a result of user test, elders enjoyed using Slot-Memento because it is elder-friendly and is easy to understand. They also enjoyed sharing their stories because they help to retrieve memories and they are pleased to see their grandchildren enjoyed listening to the stories. However, the elderly mentioned that they want this device to be used together with whole family so they can engage and interact with all members. [30] More downside of Slot-Memento is that it is not portable, making it inaccessible from other location, and is not user-friendly to family members who live distant from their grandparents. In addition, Slot-Memento aims for elderly to utilize the device and record by themselves with lack of cues given, which may be difficult for elderly who do not know where to begin the story.

Another instance is with a use of more advanced technology called Hologram<sup>11</sup>, so called "lensless photography", has been widely used by companies from diverse industries to advertise their products, services, or brands. Hologram is a technology that utilizes light diffraction to create virtual two or three-dimensional image in space. [31] The USC Shoah Foundation 's New Dimensions in Testimony pro-

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10 <https://arxiv.org/pdf/1807.09069.pdf>

11 <https://www.ihma.org/introduction.aspx>

gram developed a three-dimensional technology called Dimensions in Testimony, to create a virtual three-dimensional interactive storytelling interview at Illinois Holocaust Museum<sup>12</sup>(Figure 2.10). This technology allows audiences to meet with virtual Holocaust survivors, listening to their personal stories, and ask questions to have conversation with the virtual Holocaust survivors. [32] This museum was the first in the world to implement hologram technology as a permanent exhibition. It gives visitors stunning experience and advanced educational method in learning history and creates long-lasting and profound value through interaction and engagement with the holographic display of Holocaust survivor.

In this research, a mimic version of holographic display (or mimic 3D projection) will be utilized to achieve "realization of memento". It is a simple method that can be done by manipulating plastic sheet into pyramid shape with the top cut off and place over smartphone or tablet screen. It can create a 3D-like projection for audiences and makes image or video appear as if it is floating in air. This method works on the principle of Pepper's Ghost<sup>13</sup>, where the four symmetrically opposite variations of image are projected onto the four sides of the plastic pyramid. By principle, each side of pyramid projects the image to the center of the pyramid, which then creates a 3D-like projection. This method is chosen because it is a commonly used technique to imitate holographic display, which creates virtual two or three-dimensional image in space. The floating of object in holographic display can trick people's minds and give them sense of objects in three-dimension, or in other words, it gives the brain perception of 3D depth [33], which provides realization to mementos, and can thus deliver sense of connection and relation of audiences to objects. The use of 3D display is important in this research as a method of realizing memento and create sense of relation. According to a research titled *Amygdala Activation in Response to 2D and 3D Emotion-Inducing Stimuli*<sup>14</sup>, the study found increased activation of amygdala (a part of limbic system of the brain that involves with facial expressions and emotional responses to stimuli) in neutral and unpleasant conditions, with higher activation in three-

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12 <https://www.ilholocaustmuseum.org>

13 [https://en.wikipedia.org/wiki/Pepper%27s\\_ghost](https://en.wikipedia.org/wiki/Pepper%27s_ghost)

14 <https://psycnet.apa.org/record/2014-43479-002>

dimension compares to two-dimension scenarios [34], meaning that 3-dimensional illusions are more effective in triggering emotion to create sense of relation of audiences to image.

Since this research focuses on strengthening bonding of grandparents and grandchildren who grow up in dissimilar environments through the use of family history as a mean, it is important to enhance story learning experience and understanding of objects and environment of diverse period. Therefore, the method of mimic 3D projection mentioned above will be utilized not only because it can enhance realization of antiques to create sense of relation of audience to stories of different period, but also because this method can be easily achieved by families with insufficient technology capability.



(Source: Slot-Memento [30])

Figure 2.9 Slot-Memento



(Source: Illinois Holocaust Museum [32])

Figure 2.10 Hologram Interview

# Chapter 3

## Design

This chapter covers the overall design process of *FamiCloud*. The detailed design process from initial ideation all the way to the latest prototype (prototype III - the FamiCloud) will be discussed in this chapter.

The following sections will be covered:

- **Concept Overview:** introduction on the ideation part of this research
- **Target Audience**
- **Overview Families Situation:** investigation and analyzation on target audience, including family relationship, communication, and behaviors
- **Prototype I:** detailed discussion on concept, prototype designing, and evaluation of first prototype - the *Reminiscence of Times*
- **Prototype II:** detailed discussion on concept, prototype designing, and evaluation of second prototype - the *Reminiscence of Times*
- **Prototype III:** detailed discussion on concept, and prototype designing of third prototype - the *FamiCloud*



## 3.1. Concept Overview

This research aims to target on the social issue of aging population, especially in Taiwan. Within this enormous population of seniors in Taiwan, solitary elderly age 65 years old or above was selected in this study. As mentioned in chapter 1, these solitary elderly feel lonely due to death of their spouse or disconnection with their family members. This study focuses on grandparent-grandchildren relationship and aims to increase intergenerational bonding through sharing of family history - the grandparents past experiences.

As discussed in chapter 1, one key reason of poor relationship between intergeneration is due to lack of communication topics or infrequent communication and interaction between grandparents and grandchildren resulting from dissimilar of society and environment they experienced in their childhood. Therefore, the idea of this project is to design a media that serves as a 'conversation bridge' between grandparents and grandchildren. Through enhancing and strengthening bonding between grandparents and grandchildren, this research aims to cure disconnection and loneliness of solitary elderly and at the same time to increase children's interest and knowledge about family history.

The initial concept of this research is to design a media with the following four key elements:

- **Stories:** to create storytelling media with list of grandparents' past stories in various categories
- **Entertainment:** instead of a formal and serious media, a colorful, joyful, and animated media is decided to deliver sense of joy in learning family history
- **Interaction:** allow target audiences to interact and engage with the media rather than observing
- **Engagement:** implement appealing elements to encourage long term usage of this media for target audiences

## 3.2. Target Audiences

This research mainly focuses on two groups:

- **Grandparents** at age of 65 and above who live away from their families, and are living alone due to death of their spouse, disconnection with family, or other reasons. More specifically, these grandparents are expected to have somewhat moderate to intimate relationship with their children - the grandchildren' parents. By saying intimate relationship means to have frequent gathering and deep conversations.
- **Grandchildren** between age of 18 and 30 who have close relationship with their parents, but are disconnected with their grandparents and would like to learn more about their family stories.

The ideal scenario of this media is to have grandparents contribute to the contents, that is, to have their stories recorded and preserved in the media for grandchildren to use and learn about their family history. Grandchildren are the main target users of this media and they are expected to come up with more questions afterward. The curiosity drives the grandchildren to communicate and interact with their grandparents to seek more detailed information about the stories they just learned.

Although grandchildren are the main target users in this research, this media can also be used by the grandparents to retrieve their memory in future, or by the parents to learn more about elderly in the family, or even for the whole family to use during family gathering as a conversation bridge between older generation and younger generation.

### 3.3. Overview Families Situation

To further understand the relationship of my target audiences, two separated surveys were conducted on 23 elderly aged 65 and above, and 42 young adults between age of 18 and 30. The surveys were created digitally through Google Forms and sent to participants in Taiwan. (Detailed questionnaire is provided at Appendix page - Appendix A)

#### **Grandparents** - 23 respondents aged 65 and above

These respondents are the author's family, relatives, mother's friends, and friends' grandparents. These respondents did the survey with assistance from their children and/or grandchildren. The survey contained questions about their living status, loneliness level, and relationship with their grandchildren.

Result of this survey shows that nearly half of respondents (43.5%) are living alone and that 91.3% of total respondents feel somewhat to completely lonely. This indicates that whether living together with family or not, majority of elderly are still feeling isolated and disconnected with their family members. On the questions about relationship with their grandchildren, only 17.4% of the respondents answered they contact with their grandchildren on daily basis, 8.7% contact on monthly basis, the other 73.9% either only contact or meet with their grandchildren during special occasions like Chinese New Year or Mother's Day, or that they rarely contact each other. Moreover, when describing relationship with grandchildren on scale of 1 to 5 (1=not close at all, 5=very close), only 5 respondents gave scale of 4 and 5, the other 18 respondents answered having moderate to poor relationship with their grandchildren. Lastly, when asked if they want their grandchildren to learn about their stories, all of them gave positive responses.

#### **Grandchildren** - 42 respondents aged between 18 and 30

These respondents are the author's family, relatives, friends, and friends' friends. The survey contains questions of whether they have lived with their grandparents in the past and now, how well they think they know their grandparents, how have they learned about their grandparents' stories, and whether if they would like to learn more about their grandparents' past.

Result of this survey shows that 81% of respondents did live with their grandparents during their childhood, but today only 16.7% of total respondents are living with their grandparents. On the questions about relationship with their grandparents on scale of 1 to 5 (1=do not know anything about their grandparents, 5=know grandparents well enough), only 15 respondents gave scale of 4 and 5, meaning they are confident that they attain sufficient knowledge about their grandparents; however, the other 27 respondents gave moderate to poor scale of 1 to 3 meaning they only know a little or they do not know anything about their grandparents. Moreover, 64.3% of total respondents learned about their grandparents' stories from their parents instead of directly from their grandparents. Only 16.7% learned stories directly from their grandparents. Most importantly, when asked if they would like to learn more about their family history, nearly all respondents (37 of them) gave positive answers.

The result of these surveys of grandparents and grandchildren show that majority of elderly in Taiwan feel lonely and they are not having close relationship with their grandchildren due to infrequent contact with each other. Although some grandchildren responded that they know sufficient enough about their grandparents, the stories were not shared from grandparents themselves. Having sufficient knowledge of grandparents does not equivalent to having close relationship with them. For further investigation, 5 grandchildren who answered having sufficient knowledge (score of 4 or 5) about their grandparents were picked and asked if they think they have good relationship with their grandparents, all of them gave positive responses. However, it was because they have family gathering every once a week or once a month. By seeing their grandparents on regular basis, makes them feel they have healthy relationship with each other. Nevertheless, when asked what they do with their grandparents during gathering, all of them responded they did greeting or had conversations such as "*How is school?*" or "*When does your break starts?*". However, the communication only lasted for few minutes because grandchildren never ask questions back to their grandparents and there were no deep conversations between them. Therefore, the unhealthy grandparent-grandchildren relationship is undoubtedly at alarming status, and that every member should be aware of this situation and make effort to preserve family identity.

## 3.4. Prototype I

### 3.4.1 Concept

The first prototype - *Reminiscence of Times*, was created with the purpose of testing how much of history the grandchildren have obtained, and whether they are passionate and willing to learn family history.

This prototype was designed with game elements of two major stages: **first stage - knowledge testing**, where mini quizzes are prepared to test if grandchildren have sufficient knowledge of life in the past. Two kinds of quiz games are designed. The first one is storytelling game (Figure 3.1) where the players have to read the story with some keywords eliminated, and they have to fill in the blanks to complete the story based on the options given. The second game focuses on mementos (Figure 3.2), where the players will see a photo of historical object from their grandparents' times in the past, and they need to pick an answer of what they think is the name and purpose of the object shown in the photo. After finishing the quizzes, players can move on to the **second stage - observation and learning**, where they can observe and learn from watching a mini animation video (Figure 3.3) on the story they did on stage one, this is to enhance story learning and to facilitate players to imagine the environments and objects in the past. In order to encourage long-term usage of this media, a scoring system (Figure 3.4) was implemented with a photo of grandparents. The score is corresponding with the grandparents' photo. The more correct answers the player gets, the more colorful and saturated their grandparents' photo will be; in contrast, the photo will be faded and transparent if the players get many wrong answers. This is to warn the players that they are lacking knowledge about their grandparents' past, and they should interact and communicate with their grandparents more often to learn more about their stories.



Figure 3.1 Prototype I Quiz Game I

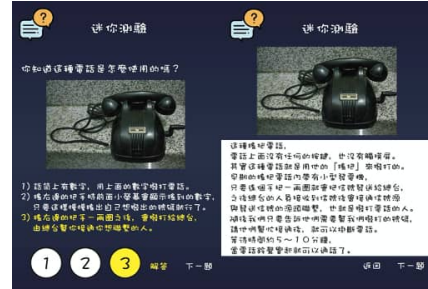


Figure 3.2 Prototype I Quiz Game II

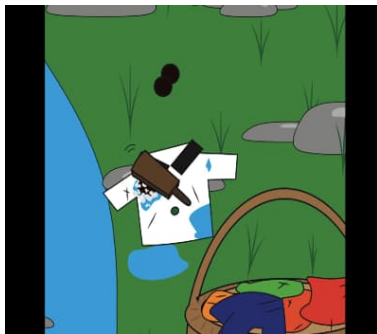


Figure 3.3 Prototype I Animation Video



Figure 3.4 Prototype I Scoring System

### 3.4.2 Design Process

#### Media Style

The first prototype of Reminiscence of Times was created with numerous slides of photos with navigation buttons across pages for players to experience the game. This game was designed with the following key elements:

- **Language:** The language used in this media is traditional Mandarin Chinese because the target audiences are families in Taiwan.
- **Images:** Photos used in this game are copyright-free sources. These photos

are applied in this game to support picturing the stories for grandchildren because in the questionnaire mentioned in Chapter 3.3 Overview Families Situation, young adults were asked whether if they have trouble learning grandparents' stories, 45.2% answered they have difficult time imaging the stories, especially the objects in past. 23.8% answered the stories are forgotten easily afterward, and 14.3% answered that listening to stories that are simply told verbally is very humdrum and difficult to concentrate to. Some also mentioned their grandparents had difficulty recalling. (Questionnaire is provided in Appendix B)

- **Animated Video:** The animation video is created with multiple drawings done in Adobe Illustrator. These drawings are then combined and edited into a stop-motion video. The accuracy of story content and objects in story are assured after multiple researches on websites such as news and blogs, YouTube videos, and interview with elderly.
- **Operation:** This game is designed to be simple and easy-to-operate. The players simply only need to 'touch' to command. This is to make it easy and stress-free for all generations when playing together during family reunion.

### Media Contents

All story topics in this game were chosen based on the same questionnaire mentioned in Chapter 3.3 Overview Families Situation done by 23 elderly age 65 and above and 42 young adults age between 18 and 30. The grandparents were asked what stories they would like to share and the grandchildren were asked what stories they would like to learn (Questionnaire is attached in Appendix C). The question provides numbers of story topic for respondents to choose from, as well as they are free to suggest topics not listed in the questionnaires. The result from both surveys show that both grandparents and grandchildren are more interested in topics related to grandparents childhood, grandparents' experience in military, mementos, and grandparents' daily routine or something they used to do but is so different to what people do nowadays. In this prototype, two general topics: cloth washing and memento (old telephone) were chosen because this prototype will be tested with grandchildren from different families, so general topic is necessary in order to relate to a broad population.

### 3.4.3 Evaluation

#### Participants and Setting

The user test for the first prototype of Reminiscence of Times was conducted in May 2019 with five participants. Two of them are female Taiwanese students at Keio Media Design. The other three include 2 female and one male young adults living in Taiwan. The detailed information are listed below.

**Participant A:** Age 23 during the time when user test was conducted, and is currently living in Japan. The user test took place at Keio Univeristy Hiyoshi Campus Collaboration Complex Building 3rd floor. Participant A used to lived with her grandparents when she was young, but now she only lives with her parents when she goes back to Taiwan for vacation. Even though her parents and grandparents are not living together, they live in the same city, and the family holds weekly gathering every Sunday at grandparents' house.

**Participant B:** Age 24 during the time when user test was conducted, and is currently living in Japan. The user test took place at Keio Univeristy Hiyoshi Campus Collaboration Complex Building 3rd floor. Participant B never live with her grandparents, but the whole family including relatives connect with each other through digital platforms updating their lives on regular basis and they always visit grandparents during special occasions.

**Participant C:** Age 24 during the time when user test was conducted, and is currently living in Taiwan. The Reminiscence of Times was shared to the participant in Taiwan and the user test took place at her house. Participant C used to live with her grandparents when she was young but they all passed away years ago. She does not have much memory of her grandparents because the grandparents passed away when she was still in elementary school. However, she usually learn about her grandparents stories through her parents, and the relatives would also share some interesting family stories during family gathering.

**Participant D:** Age 26 during the time when user test was conducted, and is currently living in Taiwan. The Reminiscence of Times was shared to the participant in Taiwan and the user test took place at his house. Participant D used to live with his grandmother when he was young, but the grandmother



passed away when he was in elementary school. Nowadays his mother has weekly gathering with the grandfather in which the grandfather and aunt would visit his house to spend time with Participant D's mother. Since the family always have chat when they are together, (though not having much interaction with grandfather) Participant D could learn family stories through listening to their conversations.

**Participant E:** Age 30 during the time when user test was conducted, and is currently living in Taiwan. The Reminiscence of Times was shared to the participant in Taiwan and the user test took place at her house. Participant E used to live with her grandparents when she was young, but ever since the grandmother passed away, she currently only live with her parents now. She does not have much memory of her grandparents because they did not communicate much.

### **Result**

After the user test, participants were asked to fill out a survey on Google Forms regarding the overall design and content of Reminiscence of Times, and impact on emotional connection and behaviors after trying the game. (Questionnaire is attached on Appendix D)

### **Design**

#### Positive Feedback

- All participants were satisfied with the visual design of this prototype. They liked the use of color and rounded text font because it conveys sense of joy while they were playing the game learning topic of grandparents' past, which is normally considered as serious topic.
- Participants gave positive feedback on the overall navigation and instruction of this game. They thought this game was simple and easy to play. They could easily follow and understand where to click to go to the next step.
- Participants enjoyed the animation videos of the story because it was easy to understand and it was helpful in enhancing them to imagine the environment and objects in past.

### **Emotional Connection and Behaviors**

### Positive Feedback

- Participants felt they gained knowledge about grandparents' life in past.
- The game enhanced participants' interest to seek more stories about their grandparents. They believed Reminiscence of Times has the potential be utilized as a facilitating tool to connect with their grandparents and other family members.

### Overall Negative Feedback

- Participants thought the game was too wordy because the story contents were all presented in text.
- More photos should be provided on all options listed in game because participants were unfamiliar with the object names listed in the options.

### Suggestions

- Some participants suggested to apply music or sound effects.
- Participants suggested to focus on specific personal stories instead of general historical stories that happened to almost everyone.
- Participants raised the questions "*How to engage everyone together to enhance family bonding?*"; "*How about apply something more interactive for whole family members instead of only focusing on the grandparents' stories?*"

## 3.5. Prototype II

### 3.5.1 Modified Concept

The second prototype of the *Reminiscence of Times* aims to trigger audiences emotion and imagination of family history. (Overall design flow: Figure 3.7) This work is mainly to test whether the use of storytelling video and mimic 3D-like display of memento as assisting tools can create positive impact in learning family history. To achieve "mimic 3D-like display of memento", a method known as the "analogue (or imitated) version" of holographic display (as discussed in Chapter 2.6.3) is chosen since the floating of object in display is known to trick people's minds and give them sense of two-dimensional objects to three-dimension while viewing in dark, or in other words, it gives the brain perception of 3D depth, which may enhance realization to mementos and trigger emotional connection of audience to the object displayed. Mimicking 2-dimensional image into 3-dimensional is decided because this research aims to create a media to be customized and controlled by family members. Therefore, creating real 3-dimensional image or video may be overly time-consuming and difficult to achieve for families. (From this chapter, the technique will be called "Mimic 3D Projection")

This prototype is designed to a particular family with stories from grandfather to fulfill the purpose of "family history" for audiences to be emotionally related to the personal story of their family, and can be used by all family members at the end. At this point, stories are limited to the grandfather's for purpose of observation and investigation on grandparent-grandchildren relationship. This prototype comes with three main stages. **First stage - family story learning** (Figure 3.5), in which audience watch a storytelling video of their grandfather sharing his stories. **Second stage - 'realization' of mementos** (Figure 3.6), in which the audiences can view the mimic 3D projection of mementos mentioned in the storytelling video. The objective of mimic 3D projection is to support viewing of both portable and/or non-portable mementos for distant family as well as to provide a simple method to present mementos as more realistic for generations who are unfamiliar with the objects. **Last stage - family interaction**, after viewing mementos, audiences are expected to raise more questions and contact their family members, especially their father, to seek for story details.



Figure 3.5 Prototype II Story-telling Video



Figure 3.6 Prototype II 3D Projection

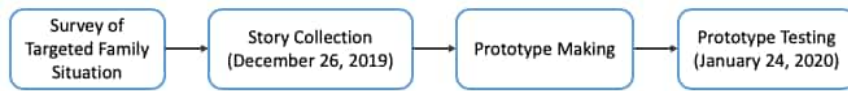


Figure 3.7 Prototype II Overall Flow

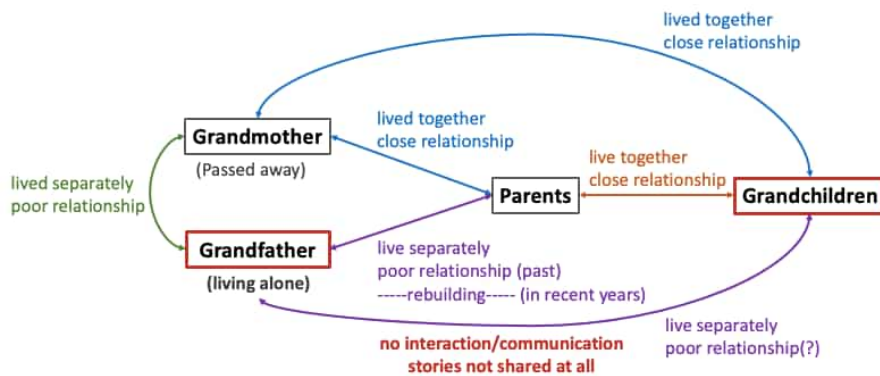


Figure 3.8 Prototype II Targeted Family Situation

### 3.5.2 Survey of Targeted Family Situation

Interview and survey were conducted on a particular family in Taiwan in November 2019 (Figure 3.8) to create the second prototype of Reminiscence of Times, which focuses on personal family stories rather than general history in old times.

The grandfather (age 84) of this family has been living alone since about 40 years ago. He and the grandmother of this family used to have poor relationship and they did not live together (the grandmother already passed away 15 years ago). Their daughters, Mother A and Mother B have been living together since they were born and they used to live together and were intimately close with their mother when she was alive. Mother A (age 57) and Mother B (age 57) used to have poor relationship with their father, but they recently started to rebuild the relationship. Due to the poor relationship Mother A and Mother B used to have with their father, their children (four of them) are also distant and disconnected to their grandfather and they rarely have communication or interaction with him.

Surveys were conducted on the grandfather and the four grandchildren regarding their relationships with each other. The questionnaires were created on Google Forms and shared to the participants. (Questionnaire is attached on Appendix E) The result of questionnaire is as below:

#### **Grandfather**

(Questionnaire is done with assistance from his oldest daughter-Aunt A)

The grandfather has total of nine grandchildren, but in this research only the four mentioned above will be focused.

The grandfather does not have close relationship with his grandchildren. Although they meet every year during special occasions such as Chinese New Year or Mother's Day, they do not interact or communicate with each other. One of the reasons is because most of the grandchildren are living abroad which makes it difficult for them to meet up and also they have lack of communication topics because they live in different environment and cultures. The grandfather said he felt very distant with his grandchildren and he would like to rebuild the relationship. Normally, he usually heard about grandchildren's stories through his children (Mother

A and Mother B) rather than directly from grandchildren themselves. He would like to have chance to have deep conversations with grandchildren instead of only greeting during family gathering. Moreover, when asked if he would like to share family history to his grandchildren, he gave positive response. He mentioned that he did not have chance to share the story at all because he rarely meet with his grandchildren and they never ask him about family story or his experiences. When it comes to the question of mementos, the grandfather said he only has a few mementos and he has never shared to his grandchildren before because there was no perfect time and situation for him to bring up the topic.

### **Grandchildren**

The four grandchildren (age 24,26,30,30) have never lived with the grandfather. Most of the time when they met is when the whole family dined together. These grandchildren realized they have poor relationship with their grandfather because when asked to recall anything about their grandfather, they could not recall much. They felt distant with their grandfather, but recently they got to see their grandfather more often when he came to visit Mother A and Mother B. They are disconnected with their grandfather because they are lacking interaction and communication topics. Even though they understand it is important to build relationship with the family, they are having hard time to find a way to start connecting with him. The grandchildren answered they did not have successful communication with their grandfather because they normally had no questions and answers going back and forth, and they do not know what to talk about. Moreover, when asked if they would like to learn some family history from their grandfather, they gave positive responses. They are interested in learning family history, but because the grandmother (whom they were mostly close with) passed away when they were young, the grandchildren were not able to acquire much information even from their parents. Therefore, they believe learning family history from their grandfather can help them to rebuild family relationship and also to understand the family as a whole.

### 3.5.3 Design Process

#### Story Collection

The core element of Reminiscence of Times is storytelling of family history. Before prototyping stage, the story collection activity was conducted in Taoyuan Taiwan on December 26, 2019 at the Mother A and Mother B's house which is more spacious for all members. Tools used in this interview include photos, mementos, voice recorder, smartphone to film video, and tripod. Before the interview day, the grandfather was asked to bring some mementos or photos to the interview to share stories related to them. Therefore, he brought some photos of the mementos because some of them are too heavy and not as portable.

The interview was conducted at the dining table with assistance of Aunt A who has the closest relationship with grandfather and is able to communicate fluently in both Mandarin Chinese and Taiwanese (as mentioned in Chapter 2, majority of elderly in Taiwan are more comfortable communicating in Taiwanese than in Mandarin Chinese). The interview was conducted in Q&A style focusing on three personal life stories: memento from his parents, his specialty as a tailor, and his military experience. Considering that grandfather might be unfamiliar with talking to a camera, rehearsals were done three times to each story topic with assistance of photos for story building and memory retrieving.

#### **Post-Interview**

After the interview, the grandfather said he really enjoyed sharing his stories because he was rarely asked to talk about himself except only from Mother A, Mother B, and Aunt A. He felt more confident about himself after sharing the stories and he also mentioned that he appreciated this opportunity for him to contribute in passing family history because it also helped him to recall all the memories in old times, which he felt is genuinely meaningful and priceless.

During the interview, photos of mementos seemed essential for grandfather to recall memory and for interviewer to come up with more questions. However, there were three obstacles occurred in the interview. First, the grandfather could not recall exact time when an event occurred. Aunt A had to assist him in calculating exact time. Second, the grandfather had hard time elaborating his story contents

without assistance from Mother A, Mother B, and Aunt A. Third, the grandfather had difficulty to understand questions when asked in Mandarin Chinese, so Aunt A had to explain all questions in Taiwanese in advance before the actual recording of interview.

### Prototyping

The second prototype of Reminiscence of Times was also created with numerous slides of photos with navigation buttons across pages for players to experience the trial. The media was designed with the following key elements:

- **Language:** Considering having some grandchildren living abroad, this prototype was created in both traditional Mandarin Chinese and English.
- **Family Tree:** Family tree is applied to the main page of this prototype in order for whole family to engage in this media in future instead of only focusing on the grandfather's part of family history.
- **Personal Information:** Along with storytelling and mimic 3D projection, each member's basic personal information is also provided in the prototype. That is because the members of this family are so disconnected with their grandfather as well as other relatives. It includes information such as birth date, occupation, and current location.
- **Storytelling Videos:** The videos recorded in the interview were edited on Final Cut Pro with calm and relaxing background music and subtitles in both traditional Mandarin Chinese and English. The videos were edited to maximum of 3 minutes each to keep audiences captivated.
- **Mimic 3D Projection:** An analogue version of hologram is use for purpose of presenting mementos in a more 'realistic' way. Due to technical incapability, a free mobile application called "Holapex Hologram Video Creator<sup>1</sup>" is used to present the prototype concept, The audiences simply need to make and place the plastic pyramid of the size of their device screen on the device to view image of mementos as floating object in air to give them sense of

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1 <https://apps.apple.com/us/app/holapex-hologram-video-creator/id1068434516>



more realistic and relatable toward the mementos. (As in Figure 3.6)

### 3.5.4 Evaluation

#### Participants and Setting

The user test for the second prototype of Reminiscence of Times was conducted with the use of iPad Air on January 26, 2020 during Chinese New Year in Taoyuan Taiwan at the targeted family's house (the same place where interview was conducted). The grandfather and two grandchildren - Grandchildren A (male, age 26) and Grandchildren B (female, age 30), of the family participated in the user test. The user test was conducted at evening at around 5pm before family dinner at home. The grandfather did the user test at the dining table where he was chatting with his daughters (Mother A, Mother B, and Aunt A), and the two grandchildren did the user test at living room where they were watching television and waiting for dinner to be served. (Figure 3.9)

#### Result

##### **Design**

##### Positive Feedback

Three participants were all satisfied with the overall design of Reminiscence of Times. They were contented with use of family tree where they could learn each member of the family as a complete family history. They also gave positive feedback to storytelling videos because the videos composed of grandfather telling his story with his face and voice in the video, which were considered valuable for the family. Also, the use of pictographs and old photos in the media stimulated participants to pay close attention to the media contents.

Furthermore, three participants, especially the grandchildren, gave moderate-positive feedback to the mimic 3D display of mementos. They mentioned they felt the objects did seem marginally more stereoscopic when seeing it in dark, in which the floating of mementos generated the brain to see objects in image more stereoscopic and realistic compare to the conventional 2D photography, whether through physical photo or digital image on the laptop screen. The grandfather

seemed amused when he saw the 3D-like display because it was completely a new experience and new technology that he was unfamiliar with.

### **Emotional Connection and Behaviors**

#### **Positive Feedback**

The grandfather said he enjoyed using this media because he got to have further conversation with his grandchildren during family dinner after the user test, which rarely happened in the past. He mentioned sharing stories allowed him to build self-esteem of what he has accomplished in his life. Surprisingly, during the conversation, the grandchildren not only responded to him but also asked him for more detail regarding to the stories they watched. The grandchildren mentioned they have heard about some stories contents from their mothers, but they were only given limited information without any details of the events. The Reminiscence of Time not only successfully serves a "conversation bridge" between the two generations, but it can also work as an ice breaking tool for family to have casual, relaxing, and joyful family gathering.

#### **Overall Negative Feedback**

- Participants were concerned about the text size, especially because this media is also going to be used by elderly.
- Participants mentioned they would like to have sound or music implemented to this media, which can also boost their emotional connection with the story contents.
- Participants mentioned navigation was unclear because there were many pictogram, but they were confused where to click to command.
- Participants mentioned the 3D-like display only had marginal impact, and indicated use of a bigger size or different method to create more impact to 'live up' the object.

#### **Suggestions**

- *"Something else to help picture the environment or content of the story?"*
- *"How to make it more engageable and appealing to all family members?"*

One interesting finding during the user test is that the grandchildren, even when not sure where the navigation button is, they would randomly click on the screen trying to find the command button; however, the grandfather would get completely lost because he was afraid to do something wrong. Therefore, during the user test, the grandfather would ask grandchildren where the navigation buttons are, and what he was supposed to do. A clear step-by-step instruction is needed for elderly who is not familiar with this type of media.



Figure 3.9 Prototype II User Test

## 3.6. Prototype III

### 3.6.1 Modified Concept

The last prototype, known as *FamiCloud*, is an improvement design from second prototype with the use of memento sound to enhance realization of antiques and additional interactive features to encourage long term interaction of family members. FamiCloud is an interactive online platform specifically for family, especially those who live distant with elderly, to share their stories and connect with each other regardless of time zone and location. The idea of the name FamiCloud comes from the cloud storage service-iCloud because FamiCloud is an online platform for families to store and preserve family stories. FamiCloud does not only allow users to learn family history through storytelling videos, sound of antique objects, and mimic 3D-like display of memento features as mentioned in prototype II, it also offers wide variety of interactive features among family members. The detailed features and overall design will be explained in the design process. (Overall flow and usage of FamiCloud are explained in Appendix F)

Considering many families in Taiwan are living distant from each other, either domestically or internationally, FamiCloud is designed as an online platform for all members to access easily anytime and anywhere. To begin using the website, all family simply needs to register for a family code where each family member, whom after signing up their personal account can join the family code to access to all information including videos and photos, that belongs to this particular family. This is to prevent privacy concerns some families may have if all information are set to public online.

### 3.6.2 Design Process



Figure 3.10 Prototype III Homepage

## Visual Design

FamiCloud was designed using HTML5 website creator-WIX (Figure 3.10).

- Interface Colors

The main color composition chosen for the interface of FamiCloud is white, very light yellow, light orange, and vivid pink (Figure 3.11). These colors are chosen to give users sense of joy while interacting with the website as the bring colors deliver positive connotations of the contents. (As someone who never study color composition, the colors chosen may not be convincible to ones with design profession) In color psychology, yellow represents happiness, optimism, and is also associated with warmth. Pink represents affection, harmony, and passion. The meaning behind these two colors corresponds with the idea and purpose of this study, and are therefore chosen as the primary colors of the overall interface. The yellow color is used for the regular navigation buttons, and the pink color is used for hover navigation buttons and texts of tutorial pages. However, while the brightness of yellow and pink can arouse attentions of users, white background is chosen to tone down the brilliance bright colors.

Main Color			
White RGB: 255, 255, 255	Very Light Yellow RGB: 255, 236, 140	Light Orange RGB: 255, 212, 90	Vivid Pink RGB: 222, 7, 100

Figure 3.11 Prototype III Interface Color Composition

- Font Colors and Styles

The font used for main titles and sub titles is Impact font style because this font can deliver the importance and power of message while attracting the audiences attentions. The font style Proxima Nova is chosen for the overall contents (Figure 3.13). This is because this font style is easy to read and can keep audiences attention on the page for longer time. Majority of texts in FamiCloud are in very dark red color (almost black) rather than true black color to tone down the overall color of FamiCloud because the richness of

true black color is too heavy and powerful. Vivid pink is used to for warning or guiding information such as Tutorial page (Figure 3.12).

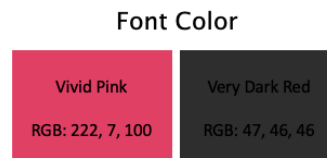


Figure 3.12 Prototype III Text Color Composition

**Font Type**  
**Main and Sub Titles: Impact**  
**Contents: Proxima Nova**

Figure 3.13 Prototype III Font Style

- Visual Contexts

As someone who is not skilled at illustration, all visuals are sources from copyright free website. Majority of visuals used in FamiCloud are sources from an icon materials website called *FlatIcon*. The icons are used at various places of FamiCloud such as navigation buttons, member profiles, materials in guideline page, and items in family tree. Another Japanese illustration website called *irasutoya* is also used at bottom of the homepage of FamiCloud to imitate and express the core features and idea of FamiCloud.

### Feature Design

At this stage, FamiCloud can only be accessed on computers and laptops. Users can manipulate FamiCloud simply by clicking navigation buttons shown across pages. FamiCloud was designed with the following key elements:

(For explanation of usage flow and photos, please refer to Appendix F.)

- **Family Tree:** FamiCloud also consists of family tree in which the family can create a tree with all family members and learn about each other's stories.

However, at this stage of prototype tryout, icons are used for the profiles of family members to protect personal identity. By clicking on profile of each family member, the following features can be accessed:

- **Personal Information:** Each family member’s personal information including birth date, current location, occupation, and living status will be shown. This is because some people are unfamiliar with distant family member who they rarely meet up or contact with.
- **Storytelling Videos:** This is the key for family to share their stories through transmission of family members’ storytelling video with their face and voice appear in the video. Detailed explanation and instruction are provided in the Guideline page of FamiCloud. This is to ensure all videos are at standard quality and can adequately deliver message to audiences.
- **Sound:** Depending on the type of memento, a sound file is provided for memento that has sound. For example, a sound file of antique sewing machine is provided in the prototype. The purpose of this is to facilitate imagination the objects in old time as auditory is an effective method to trigger memory and imagination.
- **Mimic 3D Projection:** A simple ”analogue (or imitated) version” of hologram is provided aiming to present mementos in a more ’realistic’ way. Since the result from Prototype II shows that the use of 3D display has marginal effect in ’realizing’ memento; therefore, this time the display will be presented along with the sound of memento aiming to further enhancing imagination. However, due to technical incapability, an application called ”Holapex Hologram Video Creator<sup>2</sup>” will be utilized to present the concept. The audiences need to make and place the plastic pyramid of the size of their device screen on the device to view image of mementos objects as floating object in air to give them sense of object in the image being more stereoscopic than conventional or digital image on screen. As mentioned in the previous chapter, this

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<sup>2</sup> <https://apps.apple.com/us/app/holapex-hologram-video-creator/id1068434516>

technique is used because majority of grandchildren are having difficulty imaging and relating to the objects in old times. Therefore, by viewing memento as 3D-like projection (with sound this time), though not truly three-dimensional, but the floating of object in air did give audiences positive (though marginal) impact as observed in prototype II user test.

- **Uploads:** Since FamiCloud is for families to share 'family history', members are free to manage everything on their own. FamiCloud allows members to upload media in forms of images, videos, and audio files. Members are also allowed to upload stories of other member and update personal information.
- **Story Search:** Members can search for story theme based on their preferences. Each storytelling video can be found through 'hashtag search' or 'category search' that are tagged when each video is uploaded. The category list is chosen based on the questionnaires conducted to both grandfather and grandchildren in the previous prototypes design process. The category listed are topics that are most interesting to families in general.
- **Tracking:** The number of stories each member uploads and read will be recorded inside the Member page. By clicking on the number, detailed list of videos will be shown. This is to track which family member is more active in learning family story, as well as to indirectly encourage frequent usage of FamiCloud.
- **Scoring System:** Scoring System is another method applied to encourage long term usage of FamiCloud. The more story a member read means that the more colorful and opaque the portrait will be. For example, if the grandfather has uploaded total of three videos, but Grandchildren A only read one of them, then the opacity transparency of the grandfather's portrait on the family tree will be a third on Grandchildren A's account. This aims to remind each member that it is time to catch up with certain family member.
- **Guideline:** Since FamiCloud requires family to record and upload materials on their own. A guideline is provided with instructions on how to film



storytelling video to keep consistent quality of all members, and how to make plastic pyramid to set up mimic 3D projection are explained.

- Interactive Tools:** Further interactive tools such as online chat and comment box are provided. This is to enhance family engagement on FamiCloud. After watching storytelling video, members are free to leave their thoughts under the video, such as sharing their personal experience of a similar event, or to leave questions regarding the story contents for further discussion.

The testing, evaluation, and further discussion on concept validation of FamiCloud will be discussed in detail in Chapter 4.



Figure 3.14 Prototype III Hashtag Search

Figure 3.15 Prototype III Category Search

Figure 3.16 Prototype III Guideline



Figure 3.17 Prototype III Family Tree

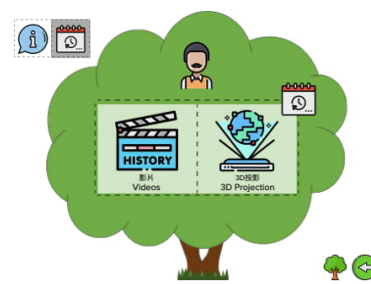


Figure 3.18 Prototype III Key Features



Figure 3.19 Prototype III Members and Tracking

# Chapter 4

## Proof of Concept

This chapter covers the detailed findings on the overall user test of FamiCloud. To proof the improvement and validation of FamiCloud from Reminiscence of Times, this user test was conducted on the same family of prototype II user test. The following contents will explain detailed evaluation on the usability and visual design of FamiCloud, along with observation and interview of changes in family relationship will also be covered in details. At the end of this chapter of FamiCloud evaluations, the two research questions raised are to be answered.

*(1) "How to effectively preserve family history as a mean to cope with family estrangement to strengthen intergenerational relationship, especially for distant grandparents-grandchildren relationship?"*

*(2) "What are effective approaches to enhance understanding of stories between disparate generations who grew up in dissimilar environments?"*

### 4.1. Research Setting

#### 4.1.1 Time and Environment

The user test was conducted on Sunday June 7th, 2020 in Taoyuan Taiwan at the exact same house where user test of Prototype II was conducted. The user test started at 2pm JST and lasted for around two hours. This day was chosen because it was a weekly gathering for Mother A, Mother B, Aunt A, and Grandfather for their art lesson. Therefore, besides 4 of them, an art teacher was also at home to teach art lesson. Grandchildren A and Grandchildren B, who

both joined Prototype II user testing, were also both at home this time during the user testing. Due to Coronavirus Pandemic, it was impossible to travel to Taiwan to instruct and observe user test in person; therefore, the overall user test was observed through Zoom video chat.

### 4.1.2 Participants

The main participants of this user test include Mother A (age 57), Grandchildren A (male, age 26), and the Grandfather. As mentioned that due to limitation of conducting and observing in person this time, Grandchildren B (female, age 30) was responsible for assisting as a facilitator and photographer; therefore, she was unable to join the user testing this time.

## 4.2. User Experience Testing

The overall user test was separated into four main parts. First part is story collection where Mother A interviewed Grandfather on a specific topic. Second part is video editing and uploading to FamiCloud. Third part is the testing of usability and design of FamiCloud including manipulating the overall FamiCloud platform and watching the interview video that was recorded in the previous stage, as well as viewing of memento in 3D-like projection while listening to sound of memento. The last part is collecting feedbacks on the evaluations of FamiCloud from Mother A, Grandchildren A, and Grandfather.

The overall flow of FamiCloud user testing and materials/equipment used are presented in the following page.

### 4.2.1 Testing Method and Tools

Table 4.1 Overall Flow of FamiCloud User Testing

Steps	Tools and Equipment Used
[May 31st: a week before user test] Interview of changes in family inter- actions	MacBook Air early 2015 version - Zoom video chat
[May 31st: a week before user test] Explanation on purpose and con- cept to participants. Mother A tried FamiCloud and prepared materials	MacBook Air early 2015 version - Zoom video chat and FamiCloud tryout
[June 7th: actual user test] Location: tea room Story collection interview	Printed question list, printed me- mento photo, memento sound file, tripod, iPhone 8, voice recorder
[June 7th: actual user test] Video editing and upload to Fami- Cloud	iPhone 8, MSI laptop, voice recorder
[June 7th: actual user test] Location: bedroom Three participants manipulating FamiCloud together	Website: MSI laptop Mimic 3D projection materials: ruler, plastic sheet, printed paper, scissor, pen, tape, iPad 5th gener- ation
[June 7th: actual user test] Location: bedroom Interview on FamiCloud evaluation	MSI laptop - Zoom video chat

The overall user test was observed through Zoom video chat with the use of iPad 5th generation for participants in Taiwan and MacBook Air early 2015 version in Japan.

All user test photos and videos were taken by Grandchildren B (female, age 30) in Taiwan using Samsung Galaxy S9 smartphone.

### 4.2.2 Pre-test Interview

On May 31st, a week before the actual user test, a short interview was conducted through Zoom video chat to participants regarding any bonding change between family members, especially grandfather-grandchildren relationship since the Prototype II user test in January 2020. Based on the result, it cannot be said there is significant change between their relationship. They still do not directly contact each other through phone calls or messages when apart, but every time when the grandfather visited the family or when the whole family went out together, they had conversation with each other, which rarely happened before they learned grandfather's story. For example, in early May when the whole family went to commemorate the deceased grandmother at her grave for Mother's Day, while in the car on the way to the cemetery, Mother A, Mother B, and Aunt A started talking about their childhood memories with the Grandfather, and Grandchildren A and Grandchildren B later joined the conversation to ask for detailed information because they were curious about their lives in past. The grandchildren said they especially enjoyed hearing stories related to Grandfather and Grandmother's relationship because even though the grandparents had poor relationship in past, Grandchildren A and Grandchildren B said they found it interesting to hear about the times when Grandmother and Grandfather were still in love and had intimate relationship with each other.

The Grandfather mentioned that in the past years, he did not have chance to really connect with his grandchildren due to his poor relationship with his children and wife. However, recently since his children (Mother A, Mother B, and Aunt A) started rebuilding relationship with him few years ago, he had more opportunities to see his grandchildren about twice a year during special occasions. Since beginning of 2020, he started to see his grandchildren more often when the Grandfather, Mother A, Mother B and Aunt A started to have weekly gathering at home for art lesson. He mentioned there was many times when he wanted to ask questions to his grandchildren but they always seem busy in the living room and he felt uncomfortable starting conversations. Therefore, when he got chances, he would ask questions to his children (Mother A and Mother B) regarding the grandchildren to learn about them and also to seek if there is chance to have

direct conversation with them. He said even though they rarely had direct one-on-one conversations with each other, but he still enjoyed having conversation with the whole family during family gathering where the grandchildren also joined conversations. He believes it will take a while for them to completely feeling comfortable to have one-on-one conversations, but he does see positive change between their behaviors and is eager to share more stories to his grandchildren, as well as learning stories from them.

Grandchildren A and Grandchildren B mentioned that since the Prototype II user test in January 2020 during Chinese New Year, they realized that they are passionate in knowing more about their grandfather. They said learning more of grandfather's stories made them feel closer to him. Although they still did not have one-on-one conversations, but when the mother was having conversation with grandfather, the grandchildren would join the conversation if they find the topic interesting. Also when the whole family was together, the grandfather would ask the mother questions regarding grandchildren, then the mother would call the grandchildren and have them answer questions directly to grandfather. This happened quite often that the grandfather-grandchildren interaction and communication in the past five month, though it cannot be said there is significant improvement, but it is undeniable there is positive transition in their behaviors and they are becoming more comfortable communicating with each other.

### 4.2.3 Design Testing

#### Topic Selection and Material Collection

On the same day as pre-test interview, Mother A tried out FamiCloud on a laptop, for the purpose of understanding the overall concept and flow of this platform because the role of parent in this case is collecting materials and share to FamiCloud for younger generations to learn. Surprisingly, it did not take her long to understand how to operate the website. She managed to manipulate with only a bit of assistance because she is experienced in using social media platform so she could quickly get used to FamiCloud. After experience FamiCloud, Mother A and the Grandfather were later told to decide on a topic to share on June 7th - the actual user test day. Few days later Mother A went to the Grandfather

house to search for memento at his home. Mother A said she found this old self-winding clock on the wall and mentioned she has seen it there for decades. She mentioned she heard the clock is a heirloom handed down from her grandparents, so she thought it may be interesting to pass down the story as well as the clock to younger generations in future. Therefore she asked the Grandfather if he would like to tell story related to the clock and he agreed. Mother A then helped the Grandfather to take a photo of the self-winding clock (Figure 4.1), recorded the tick tock and ringing sound, and was told to prepare interview question list regarding the self-winding clock as materials to be shared and utilized in the interview activity which took place on June 7th.



Figure 4.1 Prototype III Antique Self-winding Clock

### User Testing

(Photos of user testing are attached at the end of this chapter)

The actual user testing was conducted on Sunday June 7th, 2020 starting at 2pm JST and observed through Zoom video chat. The story collecting - interview part took place at tea room. The location was chosen by Grandfather because he said the Chinese teapot set on the table matches with the traditional Chinese garment that he was wearing. I found this interesting because it is the cloth he presented in Prototype II when sharing story about his profession as a tailor and this cloth he was wearing is actually designed and made by him. This shows the Grandfather was passionate in sharing his stories and he truly enjoyed this activity.

The overall interview was conducted in Taiwanese because the Grandfather is more comfortable communicating in Taiwanese. However this should not be a

problem because the grandchildren in this family are very used to listening in Taiwanese so they can understand majority of it. The overall interview took around 15 to 20 minutes with only one rehearsal. The second time went smoothly without any mistakes. This is totally unexpected because the interview went so much smoother and faster compared to Prototype II, when 3 rehearsals were conducted. Perhaps it is because the Grandfather is already experienced with this activity from Prototype II and Mother A observed the whole process so she knew how to facilitate such as giving hints to grandfather to elaborate his answers. (Figure 4.2)

After the interview session, fortunately the sound was recorded perfectly without any background noise; therefore, there is no need to use the file in voice recorder. When asked if subtitle is needed, Mother A answered it is unnecessary because the grandchildren of this family are competent at Taiwanese listening. Even if there is a few words they cannot understand, she believed it can be an opportunity for grandchildren to ask the grandfather or the parents to learn. Thus, the interview video along with the tick tock and ringing sound file are directly uploaded to FamiCloud without any editing, but still obtain quality visual, audio and contents.

The next step comes with Grandchildren A watching the interview video on FamiCloud. While Grandchildren A was watching video using his laptop at his bedroom, Mother A and Grandfather heard the video and walked to the room to join together because Mother A said Grandfather wanted to see how the video turned out. Therefore, Grandchildren A replayed the video and three participants watched the video of Grandfather sharing story about the old self-winding clock he preserved. While watching the video, unsurprisingly, Grandchildren A could not understand some Taiwanese words the Grandfather said in the video, so he paused the video and raised the questions. Mother A then translated the word in Mandarin Chinese, and Grandfather repeated what Mother A said and added extra information to what he already said in the video. (Figure 4.3)

After watching the video, the final step is viewing mimic 3D projection of Grandfather's self-winding clock while listening to audio file of memento sound. Before viewing the display, a plastic pyramid is needed. Mother A and Grandfa-



ther were nearby chatting while Grandchildren A was making the plastic pyramid according to size provided on FamiCloud. It took him around 15 minutes to make the plastic pyramid (Figure 4.4). After that, he placed the plastic pyramid on iPad to view self-winding clock in 3-D like projection (Figure 4.5). Unsurprising, the result turned out same as Prototype II in which he mentioned the clock is too small, but when seeing it closely, the way of how the image is floating in air with dark background made them felt the object is marginally lived up. However, he was later reminded there is a sound file of self-winding clock 'tick tock and ringing sound' he should check out. Therefore, he then played the sound file while viewing the projection. Grandchildren A was surprised "*I did not know the clock is still functioning well after more than 70 years!*". The Grandfather then explained "*I had it repaired a couple times at the old clock shop in my neighborhood*". Grandchildren A mentioned that although self-winding clocks can still be seen at old clock shops, museums, or department stores, a true antique self-winding clock that passed down from elder generations is extremely unique and much more valuable than any other clocks in the market. Mother A and Grandchildren A both indicated that although the 3D-like projection did marginally impact their perceptions to see the object as a bit 3-dimensional, which made it seemed marginally more 'realistic'; however, the sound of memento played an important role in enhancing imagination of the environment.

### 4.3. Findings from User Test

This section presents the evaluation of FamiCloud in two aspects: Evaluation of Design and Family Interactions. The Evaluation of Design part covers functionality and usability of FamiCloud, including the following aspects: functionality of FamiCloud features and understandability of overall visual elements, contents and structures, as well as user experiences. The Family Interactions part discusses the observation on changes in the family interaction and communication, and participants' self-assessments on the impacts of FamiCloud to their family relationship.

### 4.3.1 Evaluation of Design

Based on the observation and interview from user test, the evaluation on the design of FamiCloud is optimistic. The evaluation mainly take accounts of Mother A and Grandchildren A's feedback and a few from Grandfather because he is unfamiliar on utilizing laptop or PC and at this point FamiCloud cannot be accessed on smartphone, so he only gave partial feedback. However, he fully observed Mother A and Grandchildren A operating FamiCloud.

#### Content and Visualization

- The overall color of FamiCloud including background and text was well chosen and easy to read. Grandchildren A mentioned that the bright color helped him to focus on the page and boost his emotional behavior because it made him felt more joyful and relax while operating the website when considering family history as a serious subject.
- The content (in this part the text) was easy to read and understand. Almost all pages have a tutorial sub-page to explain how each page functions. However, participants mentioned that there are many words in Guideline page, and suggested to replace with animation video, which could also enhance understanding for older adults.
- The structure was clear and easy to follow. Grandchildren A managed to go through all pages smoothly and find all navigation buttons without help. One obstacle he had was that he missed the main page listed on the menu. He simply thought the name listed the menu list was only a title for the drop down list of sub-pages, but he managed to navigate to the main page right away. On the other hand, assistance is needed for Mother A to go through all interface and understand ways to interact with each page. This may be because young people are more willing to randomly clicking on pages to see if it will command anything. However, older generation who are not as familiar with technology would be afraid to do so. Even so, Mother A indicated that it should not be difficult for her to get used to FamiCloud because she is an active user of social media platform-Facebook, so she believed she can quickly familiarize herself with the platform.

- Positive impression was given to the uses of icons and visuals. Participants mentioned that icons and visuals clearly helped them to understand the contents better and also helped coloring the page. In addition, visual contents in tutorial pages clearly explains the purpose of each navigation icons on each interface. *"Still simple, but sufficient visualization and information given."* The Grandfather especially mentioned that visualization helped him a lot in understanding the purpose of each page (though assistance from others is still needed) because he easily get tired of reading due to his age. Seeing icons and visuals can enhance his understanding on the means of contents.

**Suggestions:**

- Provide guideline in form of video or visuals rather than texts.
- Modification on menu list. (Page listed on menu was neglected)

**Features**

For details of FamiCloud features please refer to Chapter 3.6.2.

- All participants gave moderate to highly complimentary remarks to FamiCloud.
- Participants believe FamiCloud has the potential of enhancing and maintaining family relationship, not only for sharing family history but also encourage long term interaction to both website and family.
- Features like personal information, storytelling video, memento sound, story search, tracking of activity, and scoring system received positive reviews.
- Participants like the use of Family Code to keep all information private within the family because they were first concerning about exposing family data to strangers.
- As of Mimic 3D Projection, though this time with the memento sound created did further enrich user experience and built emotional connection with the memento, the participants were concerning that the steps are complicated for older generation and indicated that they did felt 'realization' to

the object and could imagine the environment of how memento works, but mostly came from the sound of memento not the projection of memento.

- As mentioned above, participants suggested Guideline page in form of video than text to enhance understanding.
- The family interactive tool - comment box received positive review. Participants mentioned they would be willing to leave comments under video to enrich story contents as well as leaving feedback or questions that can be discussed during family gathering. However, participants were unsure whether they would use online chat on FamiCloud as they are already using instant communication tools such as Facebook Messenger or LINE to connect with their family members and receive instant replies; whereas in FamiCloud, one has to log in to the website to chat. Therefore, they think it is an unnecessary feature.
- Grandfather suggested for mobile version because he does not own a laptop
- Mother A and Grandchildren A suggested to have scheduling feature to remind regular update
- Grandchildren A pointed out that if users do not log in to FamiCloud then they could not receive notification of new videos.

**Suggestions:**

- Remove online chat
- Mobile mode or application mode
- Schedule and reminder for regular update of video
- Notification of new video through different channel other than website

### 4.3.2 Family Interactions

- The grandchildren mentioned that even though he has knowledge of history about objects in old times, he has learned it in school textbook, or seen it on television or books, but learning a particular memento owned by his

grandfather has deepened his knowledge not only about the historical object but also his family history.

- When asked how often they would use FamiCloud, the Grandfather answered as long as there is mobile version, he would love to use it as often as he can to learn stories of his family, especially he is very passionate in knowing more about this grandchildren. Mother A, on the other hand, indicated that she may be able to use it at least once or twice a month because she is busy with work and volunteer program. However, she thinks it would not be a problem for her to find few days to conduct activity. As in this user test when story collection and interview were conducted on separated day with less than 2 hours each. Grandchildren A mentioned he would love to share his stories to Grandfather especially he thinks topics related to times when he studied abroad in the United States would be interesting because grandfather as well as other relatives have never been to America, so it is also an excellent opportunity for family to learn diverse cultures.
- During this user test, it is observed that Grandfather and Grandchildren A had more interaction and communication with each other compared to Prototype II user test. Even though they still seem uncomfortable to have one-on-one private conversation, but they were both doing their best to find chances to join family conversation. Similar to last time, at the family dinner after user test on June 7th, Grandchildren A reported both him and Grandchildren B had conversation with Grandfather when they were recalling and discussing the activity they have done. Mother B and Aunt A also joined conversation to ask about the user test activity and indicated they would like to see the video after dinner. Furthermore, some behaviors observed during user testing were known to be the sign of "concentration" and "interest". For example, when Grandchildren A and Grandfather were talking while using FamiCloud platform, both of them were directly facing each other while talking. Also, when Grandfather was speaking, Grandchildren A would lean forward closer to Grandfather A while listening. Another example observed is that smiles appeared on their faces while watching the storytelling videos. The three examples given are the sign of attentiveness

and enjoyment. These indicates that participants of three generations were fully engaged while using FamiCloud and their behaviors also indicated sign of enjoyment and pleasure when learning family history.

- Participants as well as Mother B and Aunt A stated that FamiCloud is a valuable assisting tool to enhance bonding between young generation and older generation during family gathering. They mentioned that usually during family gathering, the young generation and older generation were always separated into two groups where young generation were doing what are considered as 'activities for young people' and older generation would normally have tea time while chatting; therefore, they rarely had deep talk in past.



Figure 4.2 Prototype III Story Collection Interview



Figure 4.3 Prototype III Use of FamiCloud

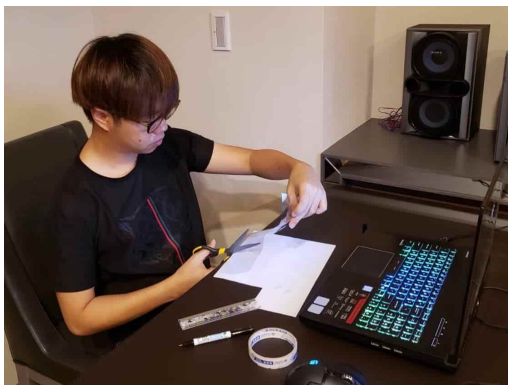


Figure 4.4 Prototype III Material Preparation

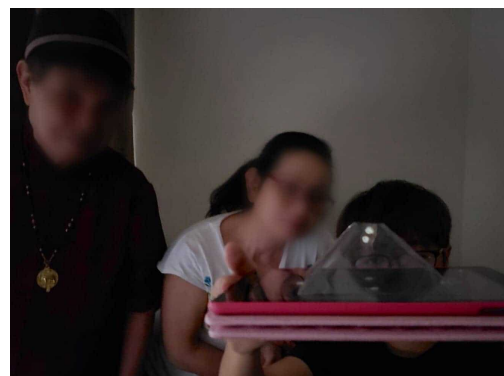


Figure 4.5 Prototype III Mimic 3D Projection

### 4.3.3 Discussion

Based on the evaluation of FamiCloud through observation, questionnaires, and interviews during user testing, the two research questioners (1) *"How to effectively preserve family history as a mean to cope with family estrangement to strengthen intergenerational relationship, especially for distant grandparents-grandchildren relationship?"*; (2) *"What are effective approaches to enhance understanding of stories between disparate generations who grew up in dissimilar environments?"*, are addressed.

As to the first question, the interactive online platform, FamiCloud, is proven to have positive impact in enhancing family bonding through preserving and sharing personal family story to the platform. By watching storytelling video of family history through a channel that can be accessed by distant family members, the result has shown this method as effective in story learning. Despite the storytelling videos are short, after watching the video, the grandchildren came up with more questions which served as an opportunity to facilitate further communication and interaction with his grandfather, whom the grandchildren are disconnected with. Moreover, to encourage further engagement and interaction between family members, features such as scoring system, tracking, and comment box are given optimistic feedback as the scoring system and tracking feature served in a way to give sense of guilt to inactive user; while the comment box encourage further elaboration of story contents that can be discussed during family gathering. The result has shown that the interactive online storytelling platform, FamiCloud, is a useful and effective "conversation bridge" between disconnected family members, and can truly enhance and strengthen intergenerational relationship of disconnected and distant family members through preserving and sharing of family history.

Considering that miscommunication or language barrier may occur between grandchildren and elders while grandchildren watch storytelling video from their grandparents, three solutions are proposed: First, for family member who has sufficient knowledge in video editing can input subtitle for young generations to completely understanding story content. Second, the interviewer can translate and repeat elders' words in Mandarin Chinese while recording the video. Third, keep the video as it is to trigger grandchildren's interest in story content and

have them directly contact their grandparents as a conversation topic to be raised during family gathering.

As to the second research question, the use of memento photos and audio have proven to be effective in enhancing learning stories of old times and truly enhance imagination of past period. Although the mimic 3D-like projection only provided marginal impact in enhancing imagination, the photo itself and sound of memento were evaluated as effective in delivering sense of connection and relation to object in old times. In addition, the storytelling video with appearance of family member, in this case, the grandfather talking in the video introducing a memento he keeps, is perceived as a valuable method in preserving family history with the appearance and voice of family member as storyteller.



## Chapter 5

# Conclusion

This chapter marks the end of this research. In the section of Validation of Concept, research concept and summary on evaluation of FamiCloud will be discussed. In the section of Research Limitation, research difficulties and unfavorable feedback that were observed and informed will be summarized. Lastly, the section of Future Work will present possible future modification and improvement of FamiCloud based on valuable feedback received.

### 5.1. Validation of Concept

Aiming to reduce loneliness and disconnection of elderly (especially solitary elderly) and at the same to increase young generation's understanding of their grandparents, an interactive online platform called FamiCloud was designed to enhance bonding between intergeneration through preserving and sharing of family history. Total of three prototypes were designed during the research period, and has come to a conclusion at the third prototype - FamiCloud, with optimistic result validating the concept of this research. The research findings that proved the concept validation will be discussed below.

- Through observation of user test and interview findings from participants, it is proven that FamiCloud has delivered valuable experience in enhancing family relationship. The grandchildren of user test family, who rarely had conversation with their grandfather, began to have more interaction and communication with each other ever since the Prototype II user test. Although the change is not very significant (due to short observation period) because they are still not fully comfortable having one-on-one private con-

versation, but there is undeniably positive improvement in their interaction.

- The short clips of video (storytelling video and memento photo) plays an important role in introducing a family history topic and facilitate further detailed discussion during family gathering. Also, the use of mimic 3D projection to present memento, although only created marginal impact in 'realizing' memento; however, when displayed with memento sound, it was given optimistic impression in enhancing imagination of story content, environment, and object. Therefore, it is suggested that to resolve the issue of 'difficulty in imagining historical object and environment', the use of sound in this case is more effective than the mimic 3D projection of memento.
- Grandchildren indicated that although he already has knowledge of some mementos presented by his grandfather in FamiCloud, watching the storytelling video has deepened his understanding not only limited to the background of historical object, but also enhanced his knowledge about family history.
- During the user testing, grandfather mentioned he is looking forward to learn stories about his grandchildren. At the same time, the grandchildren indicated he would like to share story about his study abroad experience where the environment and culture are completely different to Taiwan. This revealed their interest and passion in learning and sharing more stories to family.

Based on findings above, it is proven that FamiCloud can strengthen bonding of disconnected intergeneration through preserving and sharing of family history, and is effective in enhancing imagination of past period with presence of memento photos and memento sound. Although it is impossible to regain from emotional disconnection of family relationship in a short period of time, but the evaluation from past few months has verified that FamiCloud has potential in enhancing bonding of disconnected family members and creating understanding between intergeneration.

## 5.2. Research Limitation

### Difficulty during User Test

The user testing of FamiCloud was difficult since it was conducted in Taiwan and observed in Japan through Zoom video chat due to Coronavirus Pandemic. Therefore, the participants facial expressions, emotional responses, and behaviors could hardly be observed in details.

### Memento Display

The original idea was to film a 360 degrees photo or video of memento to enhance 'realization' of memento and create sense of relation and connection of audiences to the memento. However, considering that the filming process requires sufficient technological capability, money and time, which may be difficult to achieve by families themselves; therefore, mimic 3D projection of memento photo was decided along with memento sound.

## 5.3. Future Work

### Modification on Visual and Feature Design

#### Visual Design

- Modification on menu list since some pages were neglected.
- Modification on Guideline page. The use of video or visual is suggested rather than texts to enhance efficient understanding for older generation.

#### Feature Design

- Removal of online chat because it was considered as an unnecessary feature.
- Add schedule or reminder for regular update of storytelling video.
- Provide an alternative channel to receive notification of new video through different channel other than FamiCloud because presently if user does not log in to FamiCloud, they could not see the notification.

- Removal of Mimic 3D Projection is being considered, as the outcome was unexpectedly ineffective in enhancing imaging and 'realizing' mementos. Also the process may be overly complicated for families that are incapable in technology. However, the goal of assisting realization and imagination is still supported with the use of memento sound in FamiCloud. It has been proven that the use of photography and memento sound is sufficient and effective in building sense of relation and connection of audience to story content and family memento. Presently, the memento photos are only taken from one angle, but photos of various angles is considered for future, which could retain "imagination" of past period while to achieve "efficiency", "effectiveness", and "simplicity" for families of all ages.

### **Mobile Version**

Presently, FamiCloud cannot be viewed in proper margin and format on smartphone. However, from the feedback it is indicated that there is desire in mobile version. Since FamiCloud is an online platform aiming to create convenience for families to preserve and share their family history regardless of location, a mobile version is indeed necessary considering that not all members have laptop or computer. With a mobile version, users can upload storytelling videos to FamiCloud immediately after collection of all materials, which can be more efficient and stress free.

### **More Research Samples**

Since FamiCloud is a platform for sharing of family history or personal life stories, the user test was only conducted on one particular family due to time restriction, which means the result may not be perfectly applicable to other families. Therefore, evaluation and feedback from more families may be essential for designing a preferable and effective platform for larger population of families.

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# Appendices

All questionnaires listed below were completed by Taiwanese people with Grandfather aged 65 and above (done with assistance from their children or grandchildren) and Grandchildren aged between 18 and 30. The questions were provided in both English and Mandarin Chinese. All results collected are then summarized and translated into English as shown below.

## A. Questionnaires: Overview Families Situation

Grandparents: (23 respondents)

1. Are you living alone?

Alone: 10(43.5%), At nursing home: 1(4.3%), With family: 12(52.2%)

2. Do you feel you are alienated from society and/or your family?

Yes: 12(52.2%), No: 11(47.8%)

3. Do you feel lonely?

Yes: 9(39.1%), Somewhat lonely: 12(52.2%), No: 2(8.7%)

4. On scale of 1 to 5, how do you rate your level of loneliness?

(1=not lonely at all, 5=extremely lonely)

1: 5(21.7%), 2: 3(13.1%), 3: 4(17.4%), 4: 9(39.1%), 5: 2(8.7%)

5. How often do you contact with your grandchildren?

Daily: 4(17.4%), Monthly: 2(8.7%), During special occasions: 10(43.5%), Rarely: 7(30.4%)

6. On scale of 1 to 5, how do you describe your relationship with your grandchildren? (1=not close at all, 5=very close)

1: 7(30.4%), 2: 8(34.8%), 3: 3(13.1%), 4: 4(17.4%), 5: 1(4.3%)

7. Would you like to share your stories to your grandchildren?

Yes: 23 (100%)

**Grandchildren:** (42 respondents)

1. Are you living with your parents?

Yes: 28(66.7%), No: 14(33.3%)

2. Did you living with your grandparents when you were young?

Yes: 34(81%), No: 8(19%)

3. Are you living with your grandparents now?

Yes: 7(16.7%), No: 35(83.3%)

4. How well do you think you know your grandparents? (1=not so well, 5=very well)

1: 7(16.7%), 2: 13(31%), 3: 7(16.7%), 4: 12(28.6%), 5: 3(7.1%)

5. From whom do you usually hear about your grandparents?

Grandparents: 7(16.7%), Parents: 27(64.3%), Relatives: 5(11.9%), All above: 3(7.1%)

6. How often do you communicate with your grandparents?

Daily: 4(9.5%), Weekly: 6(14.3%), Monthly: 10(23.8%), During special occasions: 17(40.5%), Rarely: 5(11.9%)

7. Do you want to know more about your grandparents' past?

Yes: 37(88.1%), No: 5(11.9%)

## B. Questionnaires: Difficulty Learning Stories for Grandchildren

Mark all that apply. (42 respondents)

What are some obstacles you had when listening to grandparents' stories?

- Easy to forget: 10(23.8%)
- It is very humdrum and boring when stories are told verbally only: 6(14.3%)
- Hard to imagine the environment and objects in past: 19(45.2%)
- None: 5(11.2%)
- Others: Grandparents could not recall well.

## C. Questionnaires: Story Contents

Grandparents: What stories do you want to share to your grandchildren?

Mark all that apply. (23 respondents)

- My childhood: 15(65.2%)
- My children's childhood: 11(47.8%)
- Stories when my grandchildren were born: 9(39.1%)
- Mementos: 16(69.6%)
- Food in olden days: 9(39.1%)
- Education in olden days: 6(26.1%)
- Experience of war: 4(17.4%)
- Military system in olden days: 11(47.8%)
- Others: specialties/skills

**Grandchildren:** What stories of your grandparents do you want to learn?

Mark all that apply. (42 respondents)

- Their childhood: 22(52.4%)
- My parents' childhood: 15(35.7%)
- Stories when I was born: 11(26.2%)
- Mementos: 27(64.3%)
- Food in olden days: 11 (26.2%)
- Education in olden days: 11 (26.2%)
- Experience of war: 12(28.6%)
- Military system in olden days: 5(12%)
- Others: 1) Their marriage/wedding.; 2) Their living style and environment in past.; 3) Their specialties.

**D. Questionnaires: Prototype I User Test**

(5 respondents aged between 18 and 30)

1. How to you rate the overall visual design of this game? (1=unsatisfied, 5=satisfied)

1: 0, 2: 0, 3: 0, 4: 2(40%), 5: 3(60%)

2. If there is something you are not satisfied with, please list it below.

Too many words

If more photos be added in would be nice. For example, what do wood stick or bamboo stick look like. It will be nice to know when we are choosing between the options. Maybe people don't know what the things is like when they are choosing.

3. How would you rate the font, font size, and font colors? (1=very poor, 5=very good)

1: 0, 2: 0, 3: 0, 4: 2(40%), 5: 3(60%)

I think it ' s really cute

Can be separated into several pages instead putting all the words in one page. The words right now are a little too squeezed. but the size and color are fine

4. How would you rate the overall navigation and instruction of this game? (1=very hard to follow, 5=very easy to follow and understand)

1: 0, 2: 0, 3: 1(20%), 4: 2(40%), 5: 2(40%)

Easy to follow and understand, but maybe just showing one question's option in the bottom will be more clear what to do.

5. How would you rate your satisfaction toward the game content? (1=unsatisfied, 5=satisfied)

1: 0, 2: 0, 3: 0, 4: 2(40%), 5: 3(60%)

6. If you are not satisfied with the game content, please share your reason.

I really learned something :)

7. How easy is the game to play (1=very hard, 5=very easy)

1: 0, 2: 0, 3: 2(40%), 4: 0, 5: 3(60%)

8. Do you have any issue or concerns while playing the game?

I like it!

Really like your small video clip so cute!!!

9. Do you think this kind of game will help you learn more about your grandparents' past?

Yes: 5(100%)

10. Do you think this kind of game will increase your interest to know more about your grandparents?

Yes: 5(100%)

11. Do you think this kind of game can facilitate your relationship with your grandparents and other family members?

Yes: 5(100%)

12. How would you rate your overall experience with this game? (1=very poor, 5=very good)

1: 0, 2: 0, 3: 0, 4: 2(40%), 5: 3(60%)

13. What do you like the most about this game?

The design is very cute and the contents are appealing.

Knowing the things that I don't know beforehand.

Animation video and visual explanation.

I like the animation. Cute and Interesting.

Story contents.

14. What do you like the least about this game?

Reading too many words.... maybe separate them into different pages, like one question one page. Cuz now its a little stressful when u find out there are still lots of texts needed to be read when answering the questions.

Too many word to read.

The overall presentation is a little bit wordy.

Lack of sound.

15. Do you have any suggestion for this game?

Try changing the words into audio or pictures.

More photos and pictures or videos?

Everything looks good for me other than the wordy part.

Use picture instead of a lots of description and words.

## **E. Questionnaires: Targeted Family Relationship**

**Grandparents** (1 respondent-Grandfather(done with assistance))

### **Relationship with grandchildren**

1. How many grandchildren do you have and how often do you see them?

Nine. About once or twice a year during special occasions.

2. Do you consider yourself as having close relationship with your grandchildren?  
Why?

No. Because we rarely meet and never really communicate.

3. Do you feel distant from your grandchildren? Why?

Yes. Because we do not interact with each other. Also, I do not know much about them.

4. Would you like to improve relationship with your grandchildren?

Yes

5. When do you feel connected to your grandchildren?

When I see them and when I learned about them from my children.

6. How do you usually hear about your grandchildren?

From my children.

### **Communication with grandchildren**

1. What do you usually do with your grandchildren during family gathering?

Mostly only greeting.

2. Do you think you have deep conversation with your grandchildren?

We never did.

3. Would you like your grandchildren to have sufficient knowledge about family history?

Yes if I can.

4. Have you had chance to share family history to your grandchildren?

No, because I do not really see them and we do not communicate.

5. Do you think sharing family history can help to enhance relationship with them as well as whole family?

Yes, definitely.

6. How do you define a successful communication?

Having casual and relaxing conversation. If possible, having deep conversation is better.

7. Do you think you and your grandchildren have successful communication?

No, because we rarely talk.

8. What story topics would you like to share?

I would like to share mementos I keep and my living style in past.

9. Do you have any mementos?

Yes, I have some at home.

10. Have you shared any photos/mementos with your grandchildren?

I have shared some with my children, but never share with my grandchildren.

**Grandchildren** (4 respondents living together, but 2 different mothers)

**Relationship with grandfather**

1. How often do you see your grandfather? (past and now)

Mostly during special occasions or when he comes to our house, but we do not interact much.

2. How do you usually hear about your grandfather?

From mothers and relatives.

3. What do you think of relationship between you and your grandfather?



Not close at all: 4(100%)

4. If have poor relationship, please explain.

We rarely meet and rarely communicate with each other.

We do not know much about each other.

5. Do you feel disconnected with your grandfather?

Yes: 4(100%)

### **Communication with grandfather**

1. What do you usually do with your grandfather during family gathering?

Greeting.

2. Do you think it is important to have conversation/interaction with grandfather?

Yes: 4(100%)

But I do not what to talk about.

But I feel awkward to start conversation and I am not sure what I should say.

3. Do you think learning family history through communication and interaction with grandfather can facilitate your relationship with him as well as whole family?

Yes: 4(100%)

That would be interesting.

I think so. I have always wanted to learn famliy stories but never have chance.

4. How do you define a successful communication?

Questioning each other, trying to understand each other. Being comfortable having deep talk with the person.

I think understanding each other should be the first, and is the most effective mean for a successful conversation. Without first getting to know each other, it is very difficult to keep the interaction going.

Understanding each other.

Having interesting conversation topic.

5. Do you think you and your grandfather have successful communication? Why?

No: 4 (100%)

6. What story topics about your grandfather are you most interested in?

I heard my grandfather is very good at sewing, so I would like to know why he became so good at it/why did he learn it/ and who did he learn it from

Memento he keeps, and his childhood.

How him and grandmother fall in love.

I heard he has some keepsakes from decades ago.

7. Do you know if your grandfather has any old photos/mementos?

Yes: 1(25%), Unsure: 3(75%)

I heard he has some photos, but I never see them.

I think he does, but I am not sure.

I have seen one of his old photo before, but nothing else.

8. Have you had chance looking through your grandparents' old photos/mementos?

Yes: 1(25%), No: 3(75%)

## F. FamiCloud Interface and Flow

### Page: Homepage



One needs to sign up for a family code and personal account to get started. If family code is already created, then simply register for a personal account and join the family code to access to family tree.

Explanation of numbers shown above:

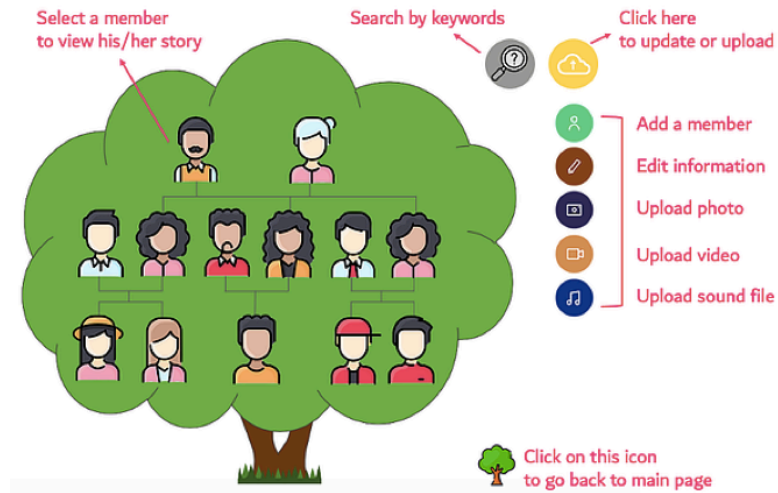
- 1) Family code, 2) Notification of new video or update, 3) Online chat with active members, 4) Sign up button to join FamiCloud

### Page: Family Tree - Story Search



One can search for desired story topic through the use of hashtag or category search.

**Page: Family Tree - Tutorial**



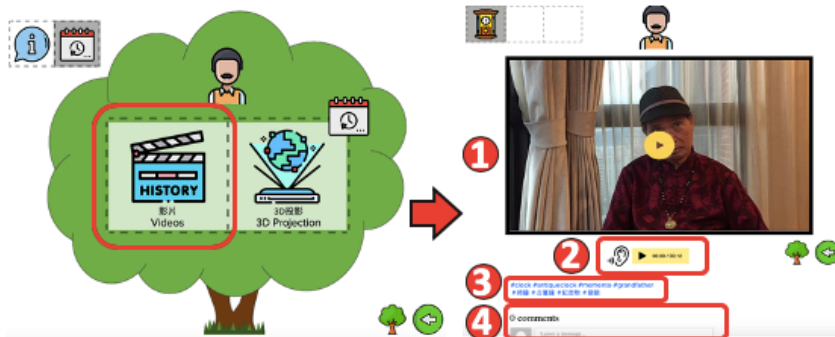
Members can upload contents in forms of photo, video, audio or text. To add a member to family tree, click on the green icon and insert his/her information and photo. The family tree will automatically grow when a new member joins.

**Page: Family Tree - Member Information**



Basic personal information of family member will be provided in Family Tree. This is for members to get familiar with distant family members who they are disconnected with.

**Page: Family Tree - Storytelling Video**



After selecting a family member, by clicking on video icon, one can choose a specific storytelling topic to view the video. The photo on the right side presents: 1) Storytelling video, 2) Short sound clip of memento introduced in the video, 3) Hashtags related to story content, 4) Comment box for audiences to leave feedback or questions for further discussion in future

**Page: Family Tree - Mimic 3D Projection**



After selecting a family member, by clicking on 3D Projection icon, one can pick a specific storytelling topic and select a specific memento photo to view in 3D projection while listening to memento sound to further enhance imagining of environment or memento. However, one would need to refer to Guideline page on instruction of preparing and setting up projection.

Page: Members - Tracking



The Member page presents detailed list of stories that are being uploaded and viewed by each family member. By clicking on the number, one will go to a page with detailed list of videos.

Page: Guideline



The Guideline page explains all features that FamiCloud offers. By clicking on ”*Click here for further instructions*”, there will be 3 pages of instructions on how to create storytelling video, how to ensure video quality, and how to create plastic pyramid to view memento on smartphone and tablet as 3D projection.