Title	Memory flipbook : a custom gift capable of recording and showing memories and memory interaction
Sub Title	
Author	王, 鶴杰(Wang, Hejie) 稲蔭, 正彦(Inakage, Masahiko)
Publisher	慶應義塾大学大学院メディアデザイン研究科
Publication year	2021
Jtitle	
JaLC DOI	
Abstract	
Notes	修士学位論文. 2021年度メディアデザイン学 第869号
Genre	Thesis or Dissertation
URL	https://koara.lib.keio.ac.jp/xoonips/modules/xoonips/detail.php?koara_id=KO40001001-00002021-0869

Master's Thesis
Academic Year 2021

Memory Flipbook: A Custom Gift Capable of Recording and Showing Memories and Memory Interaction

Keio University
Graduate School of Media Design

Hejie Wang

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

Hejie Wang

Master's Thesis Advisory Committee:
  Professor Masa Inakage   (Main Research Supervisor)
  Professor Akira Kato   (Sub Research Supervisor)

Master's Thesis Review Committee:
  Professor Masa Inakage   (Chair)
  Professor Akira Kato   (Co-Reviewer)
  Professor Kazunori Sugiura (Co-Reviewer)

Abstract of Master's Thesis of Academic Year 2021

Memory Flipbook: A Custom Gift Capable of Recording and Showing Memories and Memory Interaction

Category: Design

Summary

People have a long history of recording their own lives. In recent years, with the development of computers and the Internet, it has become easier to record life. People can record memories, such as text, photos, and videos, anytime and anywhere. Keeping a diary is a way to materialize texts. Photos can also be materialized by making photo albums. However, there is currently no appropriate way to materialize videos.

Memory Flipbook is a solution to make memories in video format as physical objects, which is capable of recording and showing memories and memory interaction. Besides, a new and creative way for couples to record their memories is given, the two memories of the couple at the same time and place from different perspectives will be put on both sides of the flipbook.

In this paper, I introduce the principle and design process of Memory Flipbook, and use experiments to verify the effect of its display video and the rationality of being a gift. At the same time, the application demo of making Memory Flipbook online was also designed and tested to verify its usability.

Keywords:

flipbook, memory interaction, life recording, custom gifts, design thinking, user experience design

Keio University Graduate School of Media Design

Hejie Wang

Contents

List of Figures

List of Tables

Acknowledgements

I am indebt to Professor Masa Inakage for guiding not only about research but with many aspects of my life, Professor Akira Kato and Atsuro Ueki sensei for giving valuable suggestions on my research.

I would also like to acknowledge my dear friends: Ding Yang, Yuxin Zhang, Chenwei Song, Yunhao Yang, Dixin Shi, Qiqi Wang for helping me a lot with my research.

Finally, I must express my very profound gratitude to my parents and to my girlfriend Ma Yue for providing me with unfailing support and continuous encouragement throughout my years of study and through the process of researching and writing this thesis. This accomplishment would not have been possible without them. Thank you so much.

Chapter 1
Introduction

Memory Flipbook is a custom gift for couples that can show memories and memory interaction. Memory Flipbook is not only a method to make memories in video format as physical objects, it also provides a new and creative way for couples to record their memories. At the same time, the online application for making Memory Flipbook allows users to make their own Memory Flipbook online completely freely.

1.1. Flipbook

1.1.1 What is Flipbook

Flipbook is a booklet with a sequence of images that rapidly change from one page to the next, giving the impression that the images are animating while the pages are presented in rapid succession. Flipbook look like a stapled notebook or any other kind of bounded books(Altın and Bingöl 2018).

The viewer does not have to "read" from left to right, but only needs to stare at the same position of the images in the flipbook when turning the page. The flipbook must be flipped through at sufficient speed for the illusion to work, so the standard way to "read" a flipbook is to hold the booklet with one hand and flip through the pages with the thumb of the other hand.

1.1.2 History and Cultural Uses

Flipbook was patented in 1868 by John Barnes Linnett from Britain who was a lithograph printer based in Birmingham. At that time, the patent was called the kineograph(Altın and Bingöl 2018), which is illustrated in Figure 1.1. It became

the first animations to use a linear, rather than circular, series of images (as in the older phenakistoscope(Wade 2016))

The German film pioneer, Max Skladanowsky, first exhibited his serial photographic images in flipbook form in 1894, as he and his brother Emil did not develop their own film projector until the following year(Narath and Guttmann 1966).

In 1894, Herman Casler invented a mechanized form of flipbook called the Mutoscope, which mounted the pages on a central rotating cylinder rather than binding them in a book. The mutoscope remained a popular attraction through the mid-twentieth century, appearing as coin-operated machines in penny arcades and amusement parks(Spehr 1980).

In 1897, the English filmmaker Henry William Short marketed his "Filoscope", which was a flipbook placed in a metal holder to facilitate flipping(Herbert 1989).

By 1948, an "automated multiple camera" for the production of "Pocket Movie flip book" portraits was marketed in the USA. This was a relatively early use of the term "flip book" that turned more common from the 1950s onward.

In the early twentieth century, flipbooks are largely regarded as children's toys or novelties and used to be common "prizes" in cereal and Cracker Jack boxes. Moreover, in addition to their role in the birth of cinema, they have been an effective promotional tool since they were created for adult products such as cars and cigarettes(Bendazzi 2015). For example, The Liggett and Myers Tobacco Company manufactured a Turkish cigarette brand under the name Fatima. The company marketed Fatimas via various platforms such as magazines, radio, and television. Flipbooks were one of their marketing strategies, and they released ten flipbooks with the theme of modern dance in 1914.

Filmmakers and artists have also used Flipbook to produce optical illusions. Breer's Image by Images as shown in Figure 1.2 was the first artist's book to use the Victorian "kineograp" or "recorder of movement", consisting of scores of minimal, abstract ink drawings, each page varying only slightly from the one before it(Altın and Bingöl 2018).
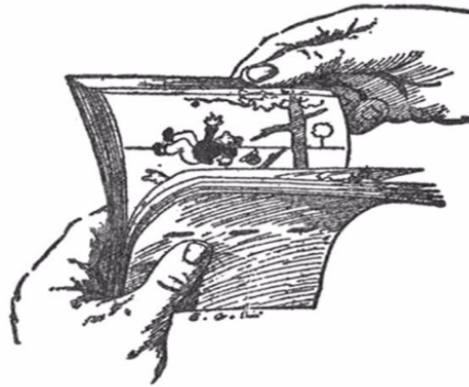
(Source: Place of flip book animation technique in communication design education(Altın and Bingöl 2018))

Figure 1.1 The kineograph or the first "flip book"

(Source: Place of flip book animation technique in communication design education(Altın and Bingöl 2018))

Figure 1.2 Robert Breer, Image by Images

1.2. Backgrounds

First of all, Since ancient times, human beings have been trying to record their lives. Today, with the development of computer technology, on the one hand, people have more choices of tools for recording their lives, such as writing text, recording sounds, taking photos, and taking videos. On the other hand, there are more and more ways to share these memories. Many social media applications can meet the needs of users to record and share life: Instagram, Facebook, Youtube, TikTok, WeChat and so on. People tend to use social media to express and communicate their personality, and the content and behavior they display, explicitly or not, convey information accurately perceived by others(Biel et al. 2011). Vlog is one of the typical cases in the form of recording and sharing life. It is a form of blog for which the medium is video. Vlog publishers replace text or photos with videos, record their personal blogs, upload and share with netizens, Vlog publishers are also called "Vloggers". Vlog originated from YouTube, and in China, it originated from the rise of the short video industry. People began to use short videos to record all aspects of their lives, such as travel, food, thoughts, work, and so on. In this context, people recorded texts and pictures can be easily made into physical books and albums, but videos can only be viewed on cell phones or computers and cannot be physicalized, so the research of Memory Flipbook is to solve this problem.

Secondly, people's habits of collection have also caught my attention. The trend of collecting sneakers and art toys has become popular among young people all over the world. Among them, Nike Air Jordan and Adidas Yeezy Boost are representative of sneakers, Sonny Angel, Molly, Bearbrick, Lego, Gundam, and Takara Blythe are typical examples of art toys. These items make countless people scramble to buy and collect. The author believes that Memory Flipbook also has the quality of collectability. On one hand, users can use their own videos to make and collect Memory Flipbook to record and recall their past. On the other hand, users can make flipbooks of videos with people around them, such as family, friends and lovers, to record and recall the good memories and memory interaction with them.

Thirdly, gift giving plays an indispensable role in human life. The gift is a carrier for the giver to convey information, emotions, and will to the recipient. It

is usually an object that people give to each other, which to please or to express kindness and respect. For lovers or couples, giving gifts to each other is not only common, but sometimes it is very distressing. Now there are too many special days to give gifts, Valentine's Day, birthdays, anniversaries, and so on, many people will worry about not knowing what gifts to give. Memory flipbook would be a customized gift that is full of heart, also has commemorative and collectible value, and it is the idea I came up with under these three backgrounds of life recording, collection and gift giving.

1.3. Research Purpose

The objective of this research is to design a physical gift named Memory Flipbook that can record and show memories and memory interaction, and design the demo of the online making application so that users can customize their own Memory Flipbook.

When designing the Memory Flipbook, a new and creative way for couples to record their memories will be proposed, through prototypes and tests, the couple's acceptance and interest of this concept will be tested, and the effect of the flipbook in recording and displaying memories will be evaluated. As for the online application for making Memory Flipbook, the usability will be evaluated through usability testing and the suggestions from users will be collected.

1.4. Thesis organization

Chapter 1 introduces what flipbook is and its history and cultural uses, and introduces the current situation of people recording their lives, giving gifts, and collecting items.

Chapter 2 reviews related studies on life recording, gift giving, current use of flipbook and online book making service.

Chapter 3 describes the concept of Memory Flipbook and the research of this thesis,the design process followed from ideation to prototype, as well as multiple iterations of the prototype.

Chapter 4 explains the proof of concept and evaluates results and insights from the prototype.

Chapter 5 concludes the research by summarizing the contributions, limitations, and future work.

Chapter 2
Related Works

To design a solution for the Memory Flipbook and an application for making Memory Flipbook online, it is important to look at the past and present related approaches. There are four sections of the related works: life recording, gift giving, current use of flipbook, and book making service. In the first section, I will look at two life recording examples and some lifelogging devices. In the second section, I will review gift giving and its related research. In the third section, I will provide two examples of the current use of flipbook. In the last section, I will examine two software that provides online book making services.

2.1. Life Recording

People have a long history of recording their own lives, by writing diaries, making journals, publishing autobiography, and even shooting biographical films. In the past 100 years, many people have tried to record their lives as comprehensively as possible. The following will introduce 2 classic cases of life recording and lifelogging devices.

2.1.1 Dymaxion Chronofile

The Dymaxion Chronofile as shown in Figure 2.1 is Buckminster Fuller's attempt to document his life as completely as possible. He created a very large scrapbook in which he documented his life every 15 minutes from 1920 to 1983. The scrapbook contains copies of all correspondence, bills, notes, sketches, and clippings from newspapers. The total collection is estimated to be 270 feet (80 meters) worth of paper. This is said to be the most documented human life in history. Over 140,000 pieces of paper, 64,000 feet of film, 1,500 hours of audio tape, and 300 hours of

video recordings make up Fuller's Chronofile. The Chronofile is alphabetically cross-referenced using 13,500 5x8 inch index cards. Fuller's early photos, dating back to the age of four, were applied retrospectively(Chu 2008). The Dymaxion Chronofile is now stored at Stanford University's R. Buckminster Fuller Collection.

(Sourced `https://hyfen.net/memex/updates/a-45-ton-personal-archive` and accessed in July 20, 2021)

Figure 2.1 Fuller's Laboratory Notebook

2.1.2 MyLifeBits

MyLifeBits is a life-logging experiment that began in 2001 to explore the use of SQL to store all personal information found in PCs, which is shown in Figure 2.2. It is a Microsoft Research project inspired by Vannevar Bush's hypothetical Memex computer system.The "experimental subject" of the project is computer scientist Gordon Bell, and the project will try to collect a lifetime of storage on and about Bell. The system initially focused on capturing and storing scanned and encoded archival material e.g. articles, books, music, photos, and video as well as everything born digital e.g. office documents, email, digital photos. It evolved to have a goal of storing everything that could be captured. The later included web pages, phone calls, meetings, room conversations, keystrokes and mouse clicks for every active screen or document, and all the 1-2 thousand photos that SenseCam captures every day. In 2006 the software platform is used for research including real time data collection, advanced SenseCams, and particular applications e.g. health and wellness(Gemmell et al. 2006).
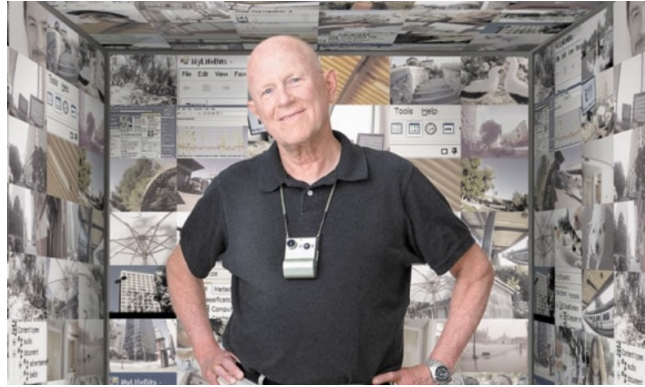
(Sourced `https://spectrum.ieee.org/telecom/security/total-recall` and accessed in July 20, 2021)

Figure 2.2 Gordon Bell and MyLifeBits

2.1.3 Lifelogging Devices

A lifelog is a personal record of one's daily life in a varying amount of detail, for a variety of purposes. The record contains a complete dataset of a human's activities. The data could be used to enlarge knowledge about how people live their lives. In recent years, some lifelog data has been automatically captured by wearable technology or mobile devices(Gurrin et al. 2014).

Lifelogging Cameras

Lifelogging cameras are a form of digital memory extension that allows users to capture and store moments in time automatically in the cloud. These devices, which are usually worn on the body or attached to clothes, enable users to be completely immersed in the flow of life without fear of missing out on photo opportunities. As illustrated in Figure 2.3, Narrative Clip 2 is one of the representative products at this stage. Wireless networking, Bluetooth, an enhanced gui, light sensitivity, and image quality, now at 8MP with a 90-degree lens, are all included in the Narrative Clip 2. The sleek, minimalistic style is just 20g in weight, measures 36x36x9mm in size, and has a modular backside for more wearing choices. It has an 8GB memory, takes a picture every thirty seconds, and allows users to manually tell it to shoot with a double click.

(Sourced `https://www.wareable.com/cameras/best-wearable-lifelogging-cameras` and accessed in July 20, 2021)

Figure 2.3 Lifelogging Camera: Narrative Clip 2

Audio Devices

Audio lifeloggers put microphones at our fingertips. They can record an important conversation, preserve a fleeting thought, or distill the auditory nature of a second with a simple tap — and share these sounds with others, or the entire world. As shown in Figure 2.4, the Kapture Audio Recording Wristband Watch is a wrist-worn wearable device that serves as a touch-sensitive voice recorder. This technology is unique as it is constantly "listening", but not recording. The user can record the previous 60 seconds of any worthy conversation, just by tapping the band. A Bluetooth connection then sends the data directly to iOS, Android or Windows smartphones.

Standalone Applications

There are many lifelogging applications in the mobile application store. They can easily capture metadata related to daily activities by using the GPS and motion processors of digital devices. As shown in Figure 2.5, Swarm is a lifelogging application that encourages users to check-in, recording every place they've visited, while inspiring them to visit somewhere new.

(Sourced `https://www.trendhunter.com/trends/kapture-watch` and accessed in July 20, 2021)

Figure 2.4 Kapture Audio Recording Wristband Watch
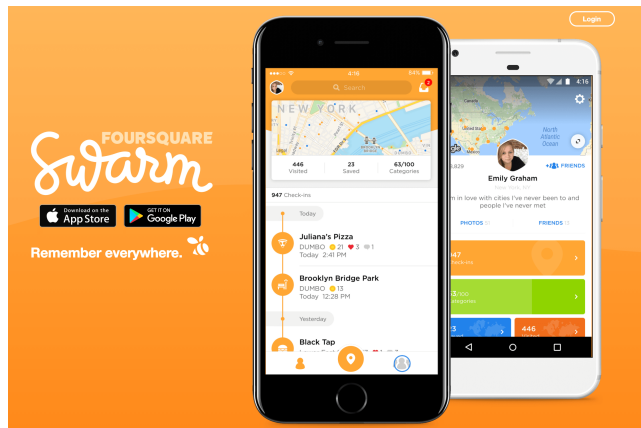
(Sourced `https://www.swarmapp.com/` and accessed in July 20, 2021)

Figure 2.5 Lifelogging Application: Swarm

2.2. Gift Giving

Since ancient times, gift giving plays an important role in human life. Gift giving is the cement of social relationships. A range of feelings may be involved in gift giving. A gift, for instance, may be inspired by sympathetic feelings or feelings of being involved in someone else's life. In other cases, feelings of being morally obliged to another person may play a role. One feels indebted toward this person because he or she done us a favor, rendered us a service, or given us a gift(Komter and Vollebergh 1997).

For couples, gift giving is an important part of the relationship between couples. But many people worries about not knowing how to choose the gift. Past studies indicate women are more involved in gift exchange in general, and Christmas gift in particular. Japanese men in general are reluctant when it comes to shopping and buying gifts. These characteristics are probably attributable to their lack of knowledge regarding what would please their partners. In that survey, Four out of 15 male respondents remarked that their most recent gift-giving involved an inquiry with their partners; they asked what their female partners wanted first and bought the exact item. One male writes that this is not a poor strategy because he thinks that asking his partner "actually pleases her even more, and because a gift-buying occasion and selecting the right gift is agonizing"(Minowa and Gould 1999).

2.3. Current Use of Flipbook

In addition to being used as children's toy and as a promotional tool for cigarettes and car brands in the twentieth century, flipbook also has some interesting uses today. In this section, I will show the current application of flipbook through two examples.

2.3.1 End Game Flipbook

dP Art Drawing, artist and YouTuber, and a big fan of Marvel Cinematic Universe, spent over 700 hours creating a truly breathtaking "Iron Man vs. Thanos" tribute

flipbook, featuring some 1400 drawings, which is shown in Figure 2.6. According to the artist's official description,

> This is the longest flipbook I have ever made. I drew over 1400 drawings to capture the most memorable Iron Man Vs. Thanos moments. There were the days I worked more than 10 hours and until 2:00 in the morning every day. I planned to draw only 1000 drawings, but I was not satisfied so I drew 400 more drawings.

As of June 7, 2021, the video documenting the drawing process and final display has received 14,884,723 views, 27,176 comments and over 670,000 likes on YouTube, and has been reposted on various social media outlets in many countries. dP Art Drawing's drawing skill and perseverance have touched tens of thousands of people.

(Sourced `https://www.youtube.com/watch?v=-mM4DJ3JyRY` and accessed in July 20, 2021)

Figure 2.6 End Game Flipbook

2.3.2 Proposal Flipbook

Artist Ben Zurawski, also known as The Flippist, creates a custom flipbook that can be used to propose to the other half. As Figure 2.7 shows, he cuts out some sections of the flipbook to create a secret compartment for the engagement ring to hide in. The whole book has 125 pages. It tells the story of the owner throwing a ball to the dog, but the dog picking up a small box with a proposal ring. This

flipbook is particularly popular in China, especially in the gift area of TaoBao. Many people choose this way to express love or make a proposal.

As of June 7, 2021, the video showing the proposal flipbook has received 5,115,353 views, 1,183 comments and 67,000 likes on YouTube. Many female users commented that if her boyfriend proposed to her with a flipbook like this, her answer would be yes.

(Sourced `https://www.youtube.com/watch?v=uZYCh-p72Ao&t=1s` and accessed in July 20, 2021)

Figure 2.7 Proposal Flipbook

2.4. Online Book Making Service

Nowadays, more and more people want to make their own photos and texts into a physical book. Due to this increased demand, more and more products on the Internet have begun to provide online book making services. In the following sections, I will introduce online book making service through a US and a Chinese software respectively.

2.4.1 Mixbook

In TopTenReviews, Tom's guide and Wirecutter, Mixbook as illustrated in Figure 2.8 is the best photo book making software. Mixbook is an Internet-based photo design tool and photo product service based in Redwood City, California. Mixbook's service allows customers to design customized photo books, cards, calendars, canvas prints and photo prints through its online interface. Mixbook derives its revenues by printing customized photo products and shipping it to customers.

To make a photo book, consumers only need to complete these four steps: First, find a design and format, or create a custom design with Blank Book; Second, upload Photos, from phone, computer, Google Photos or social media. Third, create and collaborate, flexible editor gives customers full creative control to customize images, text, stickers, layouts and more. Finally, pick the perfect size, paper type and cover, In this way, a customized photo book is completed. Consumers only need to pay, and then wait 3-5 days to get their customized photo book. Since Mixbook only provides services in English-speaking countries such as US, Canada, Europe, UK, and Australia, I cannot make a physical photo book of my own, but after experiencing the book making process online, I really like it stickers and layouts.
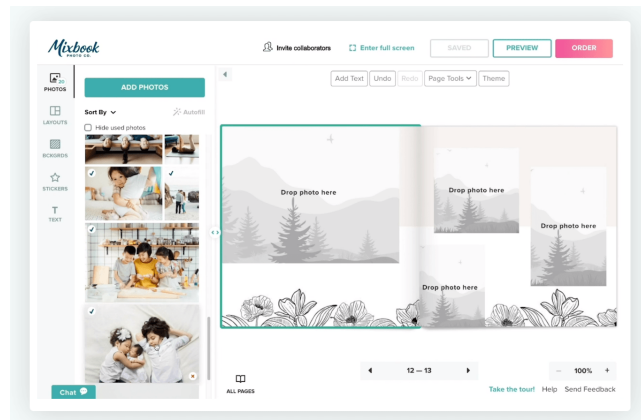
(Sourced `https://www.mixbook.com/photo-books` and accessed in July 20, 2021)

Figure 2.8 Mixbook

2.4.2 Shiqi Application

Shiqi, as illustrated in Figure 2.9, is a Chinese cultural life service tool that provides "multi-platform recording, one-click typesetting, and exquisite printing". Its biggest feature is to provide the function of printing personal diary into a book, which is a souvenir DIY function with text and books as the carrier. Shiqi Application was founded in 2016, and its slogan is "Organize and meet a better self!" The biggest feature of Shiqi is that it connects online writing records and obtaining physical souvenirs, which not only meets the needs of users to create literature conveniently and quickly, but also provides users with the choice of making their works materialized. The target users of shiqi are divided into three categories: independent writers and literature lovers; users who love to write diaries; couples, friends and other close relationships.

Although shiqi has many usage scenarios, this thesis only focuses on its book making part. "Turn life into a book, and make life more ritual." is the slogan of Shiqi's book making service. The standardized production size makes it more convenient for users to edit, and the personal works are arranged very clearly according to the classification. For novices, users can intuitively make production through graphic steps. At the same time, Shiqi also provides clearer video teaching and manual consulting service, which avoids users' doubts and lowered experience pleasure.

The function of making a book is very ritual, but it also faces a problem: it needs to fully meet the expectations of users. Due to the printing cycle and mailing, users need to have a certain waiting time before they can see the books they make bit by bit, and the waiting time often enhances the user's sense of expectation. At this time, the user's satisfaction with getting products that meet expectations will be magnified, but at the same time, the disappointment caused by printing errors and quality problems will also increase. Therefore, Shiqi needs a more complete printing system, including issues such as proofreading before printing.

2.5. Summary of Related Works

In the first section, two particularly representative examples are introduced, Dymaxion Chronofile is said to be the most documented human life in history, and

Figure 2.9 Shiqi Application

MyLifeBits is an experiment in digital storage of a person's lifetime. They are all good attempts by people to record their lives in the age when computers and Internet are not yet popular. With the popularization of computers and Internet, the improvement of the technical level of equipment processor performance, material performance and manufacturing technology, various life recording devices are available for people to use. At the same time, a variety of life recording applications have also entered people's lives. With the development of these software and hardware, it has become easier to record life, so that people can take photos or videos of the memories they want to record anytime and anywhere.

In the second section, gift giving and its related research are reviewed. Gift giving plays an important role in human life, especially between couples. For couples, there are more and more special days that require gift giving nowadays. For example, the other half's birthday, Valentine's Day, Christmas, love or wedding anniversary, and so on. Many people, particularly for men, will worry about not knowing how to choose the gift. The design of Memory flipbook will provide couples with a new gift-giving solution, thereby alleviating the problem of not knowing what gift to give.

In the third section, two modern uses of flipbook are introduced. The End Game Flipbook is a flipbook composed of more than 1,400 pictures drawn by the artist dP Art Drawing with a pencil, restoring the "Iron Man vs. Thanos" battle in Marvel, and Proposal Flipbook is a special gift with hidden rings made by

Artist Ben Zurawski. The common point of these two flipbook is that although they are both exquisite and creative, they are hand-painted by artists. Ordinary people without drawing skills cannot make exquisite flipbook, even if they want to make similar one. Therefore, Memory Flipbook and the application for making Memory Flipbook online are designed to solve this problem and enable ordinary people who can't draw to customize a flipbook of their own.

In the last section, I examine two existing websites that provide online book making services. One provides services in China and the other provides services in English-speaking countries such as US, Canada, Europe, UK, and Australia. Mixbook offers a wide range of print products, not just books, including photo books, cards, calendars, and home decor. Users can choose a format and fill it with their own photos, or customize it freely. It's worth mentioning that Mixbook is indeed a great software for making books, but it does not offer the feature of making videos into a flipbook, and the target users and features of my research are different from it. Shiqi is a software that combines recording and printing, which is certainly a good attempt, but there are still some problems in the layout and printing that need to be solved, which I need to take into consideration afterwards. Of course, although my research is different from Shiqi and Mixbook in terms of target users and functions, analyzing their book making process will effectively help help the online making process of Memory Flipbook.

Chapter 3
Concept

3.1. Design Objective

This research goes under the Memory Flipbook Project, a sub-project of MO-MENTS, PLAY. The objective of this research is to design a physical gift named Memory Flipbook that can record and show memories and memory interaction, and design the demo of the online making application so that users can customize their own Memory Flipbook.

As for designing the Memory Flipbook, which is totally different from existing flipbook services. On the one hand, Memory Flipbook will provide a new and creative way for couples to record their memories and memory interaction. On the other hand, Memory Flipbook will allow couples to participate in the production and preparation process together, which will be a common gift for couples.

The online application for making Memory Flipbook is also different from the existing flipbook service. The existing service process is that: upload the video, select the cover, and the other steps are left to the service provider to complete. This mode may cause users to be dissatisfied with the final flipbook, especially about the picture on the specific page. The Memory Flipbook application will solve this problem by adding two functions. The user could choose the alternative picture to replace the unsatisfied picture. Also, they can preview the demo to see the final effect, and they can modify the previous steps at any time before payment. In this way, users will customize their own flipbook completely freely in the Memory Flipbook application.

3.2. Design Process

Through the use of several tools in the design thinking process, the methodology for solving the problem and the prototype of this research was established. The design process consists of five main steps, and the final design is reached after many iterations.

1) Empathize: Based on the experience and needs of my friends around me and myself, I came up with the idea of materializing the video recording the life and started the Memory Flipbook project.

2) Define: Through the research of related works and pertinent research, I know the principle of video materialization, method of making a flipbook and the rationality of Memory Flipbook as a gift.

3) Ideation: Ideation is to think about how to make a physical flipbook based on the principle of video materialization on the basis of define, and consider how to show the interaction of memory by flipbook.

4) Prototyping: The further steps of each concept are prototyped for testing. Four main prototypes were developed at different stages of this research. Two of the prototypes are based on the author's video, and the other two prototypes are based on the interviewee's video.

5) Testing: In order to evaluate the effectiveness of the design, the prototypes were tested multiple times.

3.3. Empathize and Define

3.3.1 Basic Principle of Flipbook

The basic principle of flipbook is called persistence of vision. Persistence of vision traditionally refers to the optical illusion that occurs when visual perception of an object does not cease for some time after the rays of light proceeding from it have ceased to enter the eye. The ancient Chinese lantern, modern television sets,

movies and cartoons are all applications of this principle. As illustrated in Figure 3.1, children playing with fireworks in the dark is also one of the applications of the principle of persistence of vision.

Due to the special physiological structure of the human eye, when the object is in rapid motion, like flipping a flipbook quickly, when the image seen by the human eye disappears, the human eye can still continue to retain its image for about 0.1-0.4 seconds. That is, when the frame rate of the image seen is higher than about 10-12 frames per second, it will be considered as a continuous video or animation effect. Therefore, I choose the flipbook to be the solution to make videos as physical objects.

(Sourced `https://sites.psu.edu/psych256fa14/2014/10/17/the-persistence-of-vision/` and accessed in

July 20, 2021)

Figure 3.1 Persistence of Vision

3.3.2 In-depth Interviews

A qualitative research method was used for understanding the current state of life recording and gift giving, and develop effective memory recording and showing methods and gift giving solutions. The participants were voluntarily signed up (8 people)for the in-depth interviews (April 9th - April 17th, 2021). The in-depth interviews were conducted on WeChat, using both typing and voice calls. The in-depth interviews focus on the following areas:

1) The frequency, method, and scenario of recording life.

2) A review of the complete process of the most recent life recording.

3) Thoughts on gift-giving.

4) Types and scenarios of gifts received and gave.

5) Review the complete process of of the most memorable receiving and sending gifts, and how you feel about it

6) Whether you have given or received DIY gifts and how you feel about it.

The participants consisted of eight people, including two couples, as well as three other girls and one boy.

In terms of recording life issues, 7 people often use photos and videos to record their lives and memories. They usually record their lives and memories when they travel, have dinners, or see interesting things. The recording frequency is not very fixed, but basically there will be 3-5 recordings per week. Another person doesn't like to record and share his life, and may only post updates on WeChat Moments once a year. Both couples have expressed that recording their lives and looking back at these records will make them want to go well with the other half, that is, recording and reviewing the life records when they are together has a positive effect on the stability and continuity of the relationship.

In terms of gifts, the boys all expressed their preference for practical gifts, such as keyboards, sneakers, headphones, game consoles, etc. However, compared with practicality, girls are more concerned about the beauty of the gift and whether it contains intentions, that is, whether it is well prepared or made. They will like their boyfriends to give them some commemorative gifts. A girl mentioned that her boyfriend had compiled a large album of their lives on the day of their three-year relationship, which contained their photos and love words. When she received them, she was moved and cried. Another girl made a book for her boyfriend in the Shiqi Application mentioned above. She said that she made a heart-warming gift for her boyfriend because she also wanted her boyfriend to give her such a gift. It can be seen that girls have different requirements for gifts from boys. They care more about heart-warming than practicality and price.

3.3.3 User Personas

The target persona was created based on qualitative research discoveries and provided guidelines for the design process. There are two types of target users, the first is couples as shown in Figure 3.2, and the second is the people who like to record their lives as shown in Figure 3.3. For couples, especially long-distance couples, on the one hand, they desperately need an opportunity to accomplish one thing together to enhance and continue their relationship. On the other hand, choosing and making gifts is also a big problem for couples. For people who like to record their lives, such as those who have the habit of taking Vlogs and keeping diaries, they hope to find a solution for video materialization and a more convenient way to customize physical books.

USER PERSONA

Liu Shihan

ABOUT

Shihan is an international student from Beijing, China, now living in Tokyo, Japan, and studying for her Master's degree in Graphic Design at Tama Art University. She has loved design since she was a child and used to draw chalkboards in her class when she was a child, and chose to major in art-related fields when she grew up. Now she occasionally takes orders online to do design, such as hand-drawing, poster design and so on. She is now in a relationship and has a boyfriend of 3 years who works in Beijing.

AGE	22
OCCUPATION	Student
STATUS	Dating
LOCATION	Tokyo, Japan

PASSIONATE   EMPATHETIC
CURIOUS   ADVENTUROUS

FRUSTRATIONS

- Due to long-distance relationship, she can only see her boyfriend once a year
- She is alone in Japan, sometimes feels very lonely, and misses boyfriend
- She still doesn't know what gift to give on her boyfriend's birthday

GOALS

- Find something that couples can do together to ease the feeling of missing
- Find a gift solution that both makes her satisfied and impresses her boyfriend
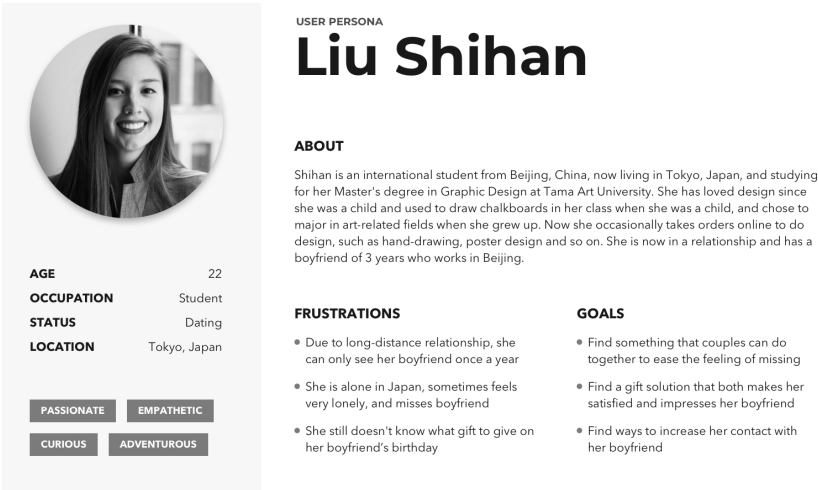- Find ways to increase her contact with her boyfriend

Figure 3.2 Couples

3.3.4 User Stories

Couples

Shihan is an international student from Beijing, China, now living in Tokyo, Japan, and studying for her Master's degree in graphic design at Tama Art University. She has a boyfriend of 3 years who works in Beijing, and they could only

USER PERSONA

Zhang Yuxuan

ABOUT

Yuxuan is an independent woman in the new era. After graduating from university, she worked in Shanghai, China as a professional photographer. She was very interested in photography when she was in college, and she often took pictures and videos with her camera. Now she also takes some short videos and vlogs and uploads them to her SNS website outside of work. At the same time, she likes to record her life by keeping a diary. Now all the diaries she has finished are collected neatly on the bookshelf.

AGE 25
OCCUPATION Photographer
STATUS Single
LOCATION Shanghai, China

CREATIVE   OPTIMISTIC

HARDWORKING   CONFIDENT

FRUSTRATIONS

- The beautiful videos she took by herself cannot be shown in the diary
- Although she wants to make a book by herself, it is too much trouble

GOALS

- Find a solution to materialize the video
- Use a software that can help people easily customize books

Figure 3.3 People Who Like to Record Their Lives

meet once a year. Due to the long-distance relationship, her boyfriend's busy work schedule, and Shihan's loneliness in Tokyo, they both miss each other very much. With her boyfriend's birthday coming up, Shihan didn't know what gift to prepare for him. She decided to try Memory Flipbook. She opened the application and uploaded a video of her boyfriend and her, carefully selected the pictures, and uploaded her own hand-drawn cover picture to create a beautiful Memory Flipbook. Her boyfriend was very touched after receiving it. After that, they made one Memory Flipbook after another, and Shihan never felt lonely in Tokyo anymore. Whenever she missed his boyfriend, she would take out the flipbook and flip through it, and the beautiful memories would come back to him as if her boyfriend is by her side.

People Who Like to Record Their Lives

Yuxuan is an independent woman in the new era. After graduating from university, she worked in Shanghai, China as a professional photographer. She has liked to record her life since she was a child. She has developed the habit of writing diaries since the first grade of elementary school. Now her bookshelves are neatly arranged with previously written diaries. Because she likes to record

life, she turned her hobby into a career and became a photographer. At the same time, she is also using the camera to record her life. But there has always been a problem that plagued her, that is, how to put the video that she took into the physical book, instead of coldly storing it in the computer and camera in the form of data. She had also tried to process the video herself and make a flipbook before, but they all ended in failure. She decided to try Memory Flipbook. The simple steps, upload videos, select pictures, add covers, and pay. Within a week, a beautiful hand-flip book appeared at her doorstep in the form of express delivery. Unpacking the courier and flipping the flipbook, the paper that feels good, the experience of turning the process, and the coherent animation all make her very satisfied. At that moment, she was full of accomplishments and decided to make all her favorite videos into a flipbook on the Memory Flipbook Application.

3.3.5 Scenarios

Two design scenarios in the storyboards present two kinds of Memory Flipbooks and their instructions.

As illustrated in Figure 3.4, the first is the double side flipbook designed for couples, family, and friends. The double side flipbook needs to upload two videos in the Memory Flipbook Application. Users can invite their couples, friends or family to make the flipbook together. After the flipbook is made, two videos are displayed on both sides of the book. The memories of the two people are recorded together in a small flipbook, and whenever users flip through it, the good memories of their time together will come into view.

As illustrated in Figure 3.5, The second is a single side flipbook for single person. Users can upload their favorite videos to the Memory Flipbook Application and customize a single side flipbook. When the pages of the book are quickly flipped, users can see continuous animations made with their favorite videos.

Furthermore, as illustrated in the storyboards, these two flipbooks can realize the materialization of videos. They are not only a good way to record and display memories, but also a good gift choice.
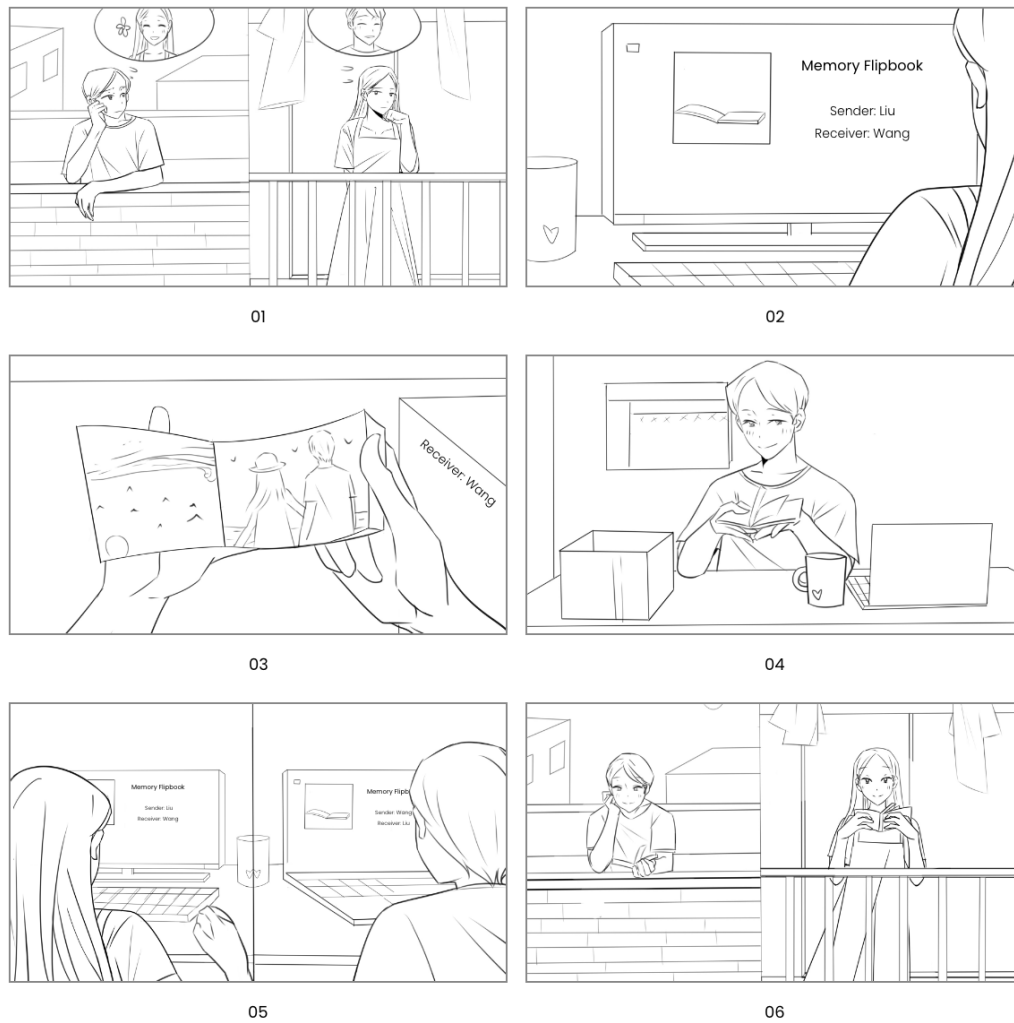
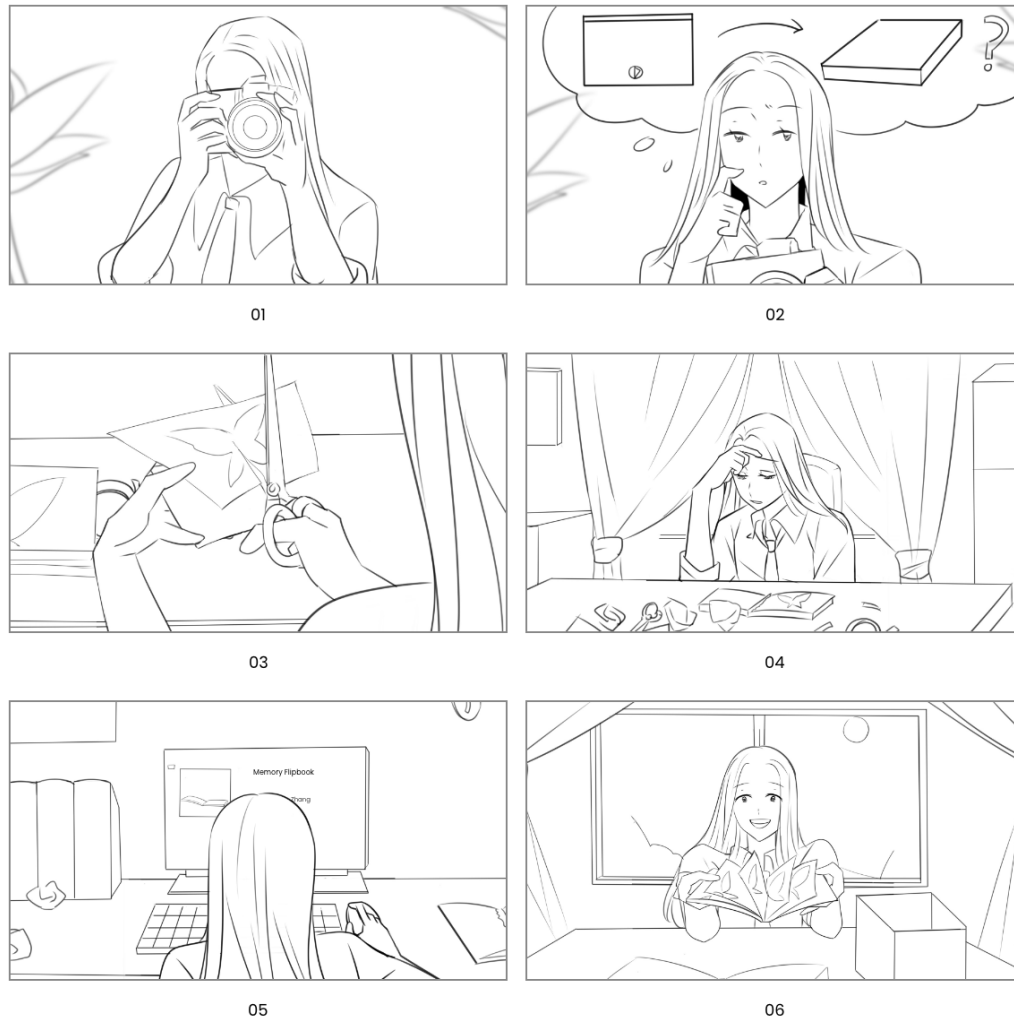Figure 3.4 Storyboard 1: Couples

Figure 3.5 Storyboard 2: People Who Like to Record Their Lives

3.4. Ideation and Concept Sketching

3.4.1 Sketch of Concept

Two kinds of flipbook will be designed in the research of Memory Flipbook, double side flipbook and single side flipbook.

Double Side Flipbook

As illustrated in Figure 3.6, double side flipbook is to make two videos on both sides of the same flipbook. When the flipbook is flipped from the front side, the content of a video is displayed; when the flipbook is flipped from the reverse side, the content of another video is displayed. When the two videos have a certain connection, then this double side flipbook will become more interesting.

There are two sentences in the Broken Chapter written by the modern Chinese poet Bian Zhilin: As you are enjoying the scenery on a bridge, upstairs on a tower people are watching you. Double side flipbook can show the scene in the poem very well.

When the two videos used to make the double side flipbook, one video is a girl recording the scenery in the first perspective, and the other video is a boy recording the girl in the third perspective, then the different memories of the two people in the same place at the same time will be recorded together. That is the scene in the poem: While the girl is looking at the scenery, she also becomes the scenery of the boy. Make these two videos into one flipbook, then the different memories of the two people in the same place at the same time will be recorded together.

When they flip this flipbook, they can recall their own memories on one hand, and when they turn to the other side and flip again, they can see the memories of their other half in the same place at the same time. This flipbook not only can record and display the memories, but also can promote the connection between two people and their feelings.

Flip From the Front Side   Flip From the Reverse Side
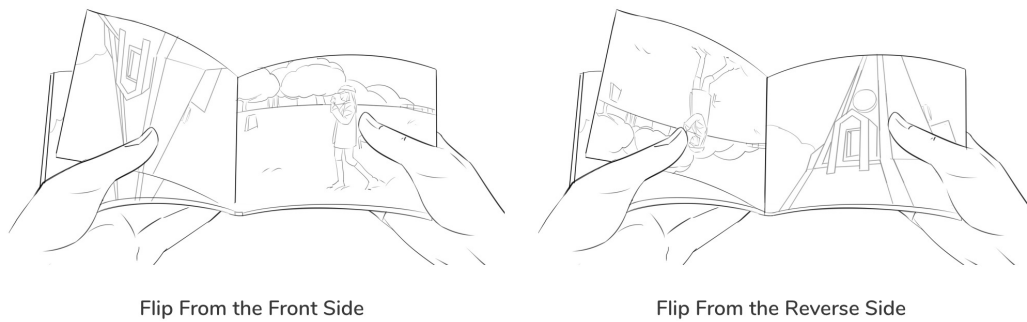
Figure 3.6 Double Side Flipbook

Single Side Flipbook

As illustrated in Figure 3.7, single side flipbook is to make only one video into a flipbook, that is, flip it from the front side to see the content of the video, and the reverse of the flipbook is a blank page without printing anything.

People can choose to make their own memories videos or favorite videos into single side flipbooks, and then collect them according to categories. Whenever they flip these flipbooks, the memories in the past will come into view.

Figure 3.7 Single Side Flipbook

3.4.2 Traditional Flipbook Drawing

The traditional flipbook is drawn with paper and pen, which is shown in Figure 3.8. The person making the flipbook needs to have some drawing skills, and patience and perseverance are required in the process of making. The following steps will be introduced:

1) Take a stack of paper. Notepaper, post-it notes, notepads, printing paper, or the corners of a book are also available

2) Choose a theme. The objects or characters need to be decided.

3) Put the sticky notes or notebooks together neatly. If they are scattered, the flipbook may not be able to move or even become fragmented.

4) Draw an image on the bottom sheet of paper in the stack. If drawing for the first time, the person can draw with a pencil so that the mistakes can be corrected. If the person wants to make the flipbook smoother and clearer, the draft can be made first.

5) Turn to the next "frame" (the next page from the bottom). In theory, it should be possible to see the previous painting through the paper. If not, it may mean that the paper is too thick, or the line drawing is too light, do it again.

6) Repeat the above process. Keep drawing the protagonist or small objects until the flipbook is completed. Make small adjustments every time to make the character or the small object seem to be about to change position or move.

7) Try it. Test the final result to see if the character moves as expected. If it doesn't seem to need to change too much, just rework it a little bit and make a small change to make the animation look more feel.

3.4.3 Drawing Flipbook with Computer

In addition to the traditional drawing of flipbooks with pen and paper, people can also choose to use some software on the computer to make flipbooks. Compared

(Sourced `https://www.youtube.com/watch?v=Bzf9uS94PE8` and accessed in July 20, 2021)

Figure 3.8 Traditional flipbook drawing

with the traditional flipbook drawing which requires drawing ability, this method requires the ability to use computers and software.

1) Open an image software. Such as Adobe Photoshop, GIMP, or other image processing software with layers.

2) Create a new file. Let it have the same size as a "sticky note": a square, 800 pixels in length and width, and a resolution of 300 dpi, which looks good.

3) Set the background to white. If wanted, a certain background can be set that will be displayed in every frame.

4) Create a new layer. This will be the first "page" of the flipbook. In the example, I drew a Matchstick Man.

5) Duplicate the first layer. After finishing layer one, copy it and adjust the transparency of layer one to 20 percent. Then the layer will be grayed out so that the image drawn on the next layer can be seen more easily.

6) Draw on the new layer. As illustrated in Figure 3.9, remove the parts of the first layer that you don't want to keep, and then draw the new ones. In the following example, the position has been slightly changed.

7) Duplicate the new layer. Repeat the process of erasing and modifying, and then draw the next step until getting the final frame.

31

8) Preview. After drawing all the layers, if the image software has the option of creating animation, you can create an animation that only displays one frame at a time. If the effect does not make a satisfactory, go back and make some adjustments until satisfied.

9) Printing, cutting, and binding. Print out all the final layers, cut them out, and glue them into a book. In this way, a flipbook made with a computer is completed.
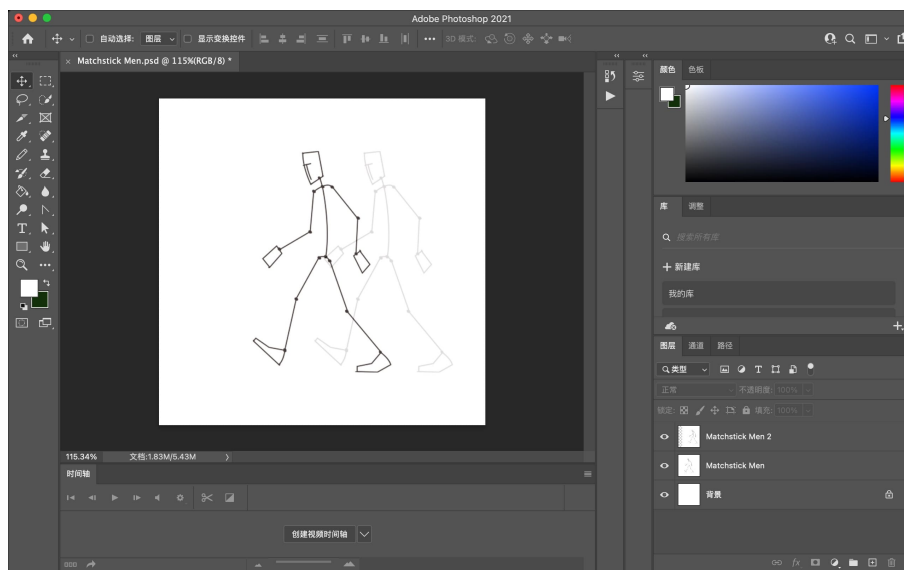
Figure 3.9 Drawing Flipbook with Computer

3.4.4 Making Flipbook with Video

The making principle of Memory flipbook is the process of processing existing video into flipbook. Making flipbook with Video and drawing flipbook with computer are very similar. They both use the image processing software Adobe Photoshop, but there is no need for the creator to draw on the computer. There are three main steps:

1) Extract the picture. In Adobe Photoshop, a series of pictures with minor changes are extracted from the video. For example, one picture is extracted

every 20 frames of the video, and these pictures are extracted into successive layers.

2) Preview the effect. Adobe Photoshop provides the function of animation preview. does not make a satisfactory, re-extract and adjust until satisfied.

3) Printing, cutting, sorting, and binding. Print out all the final layers, cut them with a paper cutter, sort them in order, and glue them together. In this way, the video has been turned into a flip book, and it has been materialized.

The specific implementation and the expected results generated by this concept will be shown in the subsequent chapters.

3.5. Concept Summary

To sum up, Memory Flipbook is a custom gift that can record and show memories and memory interaction. Its size is about the size of a human palm for easy reading and carrying. And the basic principle of Memory Flipbook is persistence of vision. Due to the special physiological structure of the human eye, when flipping a flipbook quickly, it will be considered as a continuous video or animation effect.

It is used in the same way as the traditional flipbook, the viewer needs to hold the booklet with one hand and flip through the pages with the thumb of the other hand, and stare at the same position of the images in the flipbook when turning the page. The prominent features of Memory Flipbook are:

- Provides a new way for couples to record their memories and memory interaction. Achieve the concept that while the girl is looking at the scenery, she also becomes the concept of the boy. When flipping from the front side and the reverse side, two videos from different perspective but in the same place at the same time will be shown.

- Memory Flipbook is a common gift for couples which allows couples to participate in the production and preparation process together.

- Provide a service that users customize their own flipbook completely freely. The user could choose the alternative picture to replace the unsatisfied picture. Also, they can preview the demo to see the final effect, and they can modify the previous steps at any time before payment.

In addition, there are several scenarios where Memory Flipbook can be applied. Users can use it to record unforgettable memories like birthday parties, anniversaries, hanging out with friends, and smooth moves in sports like skateboarding or skiing. Memory Flipbook is also a good gift choice for holiday greetings, weddings, corporate promotions, Valentine's Day, Mother's Day, Father's Day, and so on.

The initial concept of Memory Flipbook was consolidate through testing on four prototypes. All the details concerning prototyping and setting of user tests will be described in the following chapter.

3.6. The First Prototype

According to initial concept, the first prototype is an attempt at the theory of making flipbook with video, to check whether the steps are correct, to check the effect of recording and displaying memories, and to have a detailed understanding of the process of making a Memory Flipbook. And through preliminary interviews to determine the effect of the realization of the concept and their evaluation and suggestions for this prototype. The first prototype was made using videos of the my girlfriend and I.

3.6.1 Making Steps

Step1: Shoot Videos

As illustrated in Figure 3.10, in this step, the first prototype uses two tourism videos of my girlfriend and I traveling to Odaiba. The first video is a video taken by my girlfriend on her mobile phone, recording the scenery of Odaiba in her eyes, which is from the first perspective. The second video is a video taken by myself on my phone, recording my girlfriend in my eyes, which is from the third perspective.

Because my girlfriend and I don't want the phone to appear in the video, I don't shoot two videos at the same time and place. She shoots the video first, remembering the path, actions and time taken during the shooting. After that, I shoots the video of her walking the same road with the same path, action, and time, using this method to simulate shooting at the same time and place. Both of these two videos have 87 seconds long, and they are 1080p, 60fps.
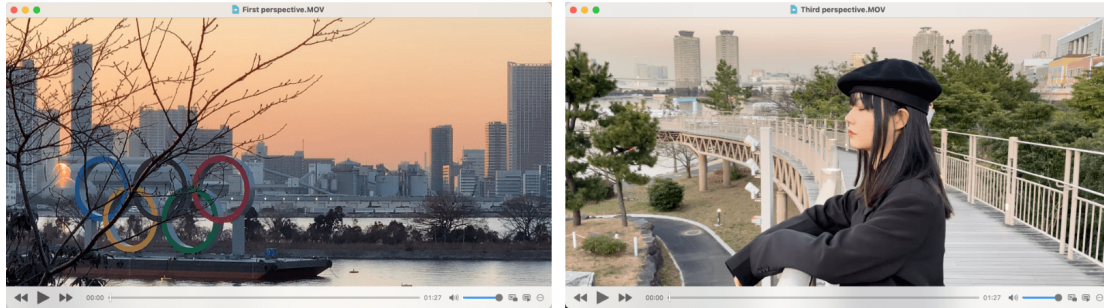
Figure 3.10 Step1 of the First Prototype: Shoot Videos

Step2: Extract Pictures

Based on the video, the next step is to process the video into continuous pictures. I used Adobe Photoshop to extract the pictures. Adobe Photoshop has a function named Video Frames to Lays, the user can just select a video clip and input the number of frame interval. What I set is to generate a layer every 70 frames, plus the video is 87s and 60 fps, so a total of 75 layers are generated, and finally export these layers into pictures. After this step is completed, I get two folders both containing 75 photos, one is from the first perspective, and the other is from the third perspective, which is shown in Figure 3.11.

Step3: Layout

The purpose of this step is to make preparations before printing. Since double-sided printing will be used later, the spacing issues should be considered in the picture layout to avoid picture misalignment. In this step, I used Adobe Indesign for picture layout. I chose to lay out 4 pictures of the same size on each A4 paper,
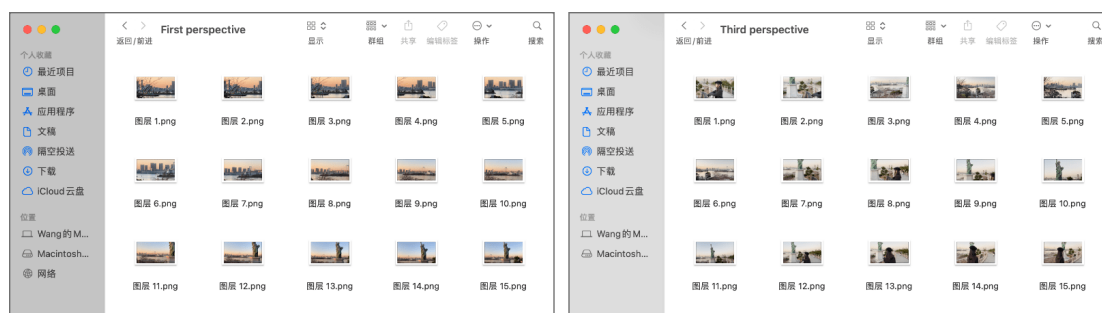
Figure 3.11 Step2 of the First Prototype: Extract Pictures

and the spacing between the pictures was 4 mm. After finishing the layout of the pictures from the first perspective, I considered the problem of double-sided printing. The last picture viewed from the front side should correspond to the first picture viewed from the reverse side, so pictures from the third perspective should arrange from the second sheet in the first page, only in this way will there be no error when printing. After the pictures in the two folders have been typeset, export them to a PDF file to proceed to the next step, which is illustrated in Figure 3.12.
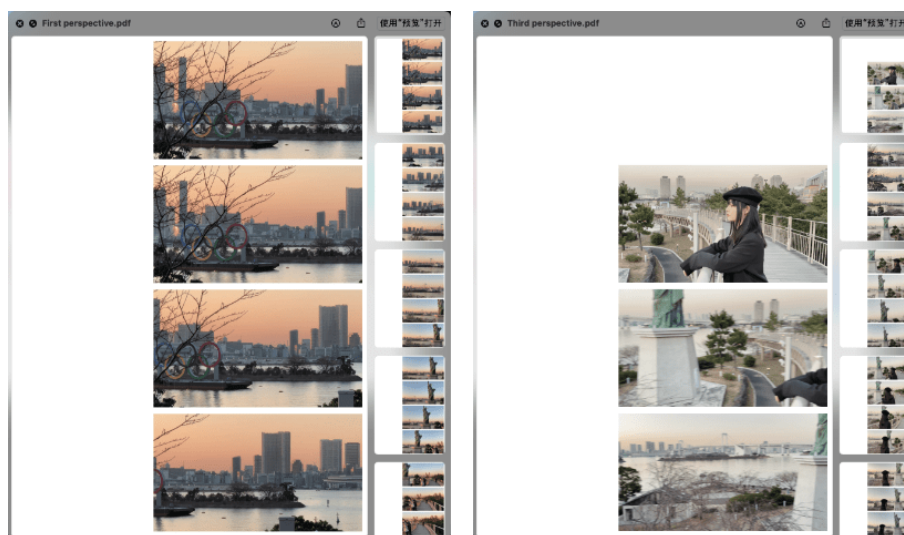
Figure 3.12 Step3 of the First Prototype: Layout

Step4: Print, Crop and Bind

Since I don't have a printer or a paper cutter, I did this step in Kinko's. When I tried printing for the first time, I chose to print in black and white on plain paper to determine the printing process and make sure that the 2 sides of the pictures are correct. After confirmation, I chose a thicker paper to make the book easier to flip and finished the color printing. After that, I used the paper cutter in Kinko's to keep the size of the picture consistent. Finally, I chose adhesive binding to bind the pages into a book.

Step5: Make a Cover

In the last step, I used kraftpaper and glue to make a handmade cover. So far, as Figure 3.13 shows, a customized Memory Flipbook is complete. The final dimensions of the flipbook are: length 15cm, width 7cm, and thickness 1.5cm. Except for the video shooting and traffic time, the rest of the steps took a total of 3 hours.

Figure 3.13 the First Prototype

3.6.2 Testing and Results

The interview method was used in the first prototype test. I invited 10 interviewees to participate in this test, of which 6 were completed online and the remaining 4 were completed offline. Online test and offline test only differ in the way of concept explanation and prototype experience, and the interview questions are completely the same.

The online test steps are as follows: introduce the Memory Flipbook project, play the demonstration video and briefly explain the concept and making process: The goal of the Memory Flipbook project is to make a flipbook that can realize memory interaction. It is inspired by a modern poem, "As you are enjoying the scenery on a bridge, upstairs on a tower people are watching you." I completed this prototype during a trip with my girlfriend. This book is turned from the front to show the scenery in the eyes of my girlfriend in the first person; this book is turned from the back to show the girlfriend in my eyes in the third person. Flipping the book from the front side, the scenery in my girlfriend's eyes will be shown in the first perspective. And flipping the book from the reverse side, my girlfriend in my eyes will be shown in the third perspective.

After leaving the interviewees time to think about and confirm their understanding of the concept of the Memory Flipbook, ask them the following four questions:

1) Would you like to give or receive a gift like this?

2) If there is an application, you only need to upload a video of you and your lover (or friends or family) to get a your own Memory Flipbook. Would you like to use this application?

3) Before making the flipbook, two videos are required. One is my girlfriend holding a mobile phone to take videos of the scenery, and the other is that I use my mobile phone to take videos of her at the same time. Do you think this kind of video recording is too difficult?

4) Do you have any suggestions for the Memory Flipbook?

The offline test steps is to let the interviewees flip the prototype by themselves, and then introduce the making process and concept face to face. The interview questions are same with the online test.

The results of the interview are as follows:

For the first question, among the 10 interviewees, 4 are willing to make and give such gifts, and 6 want to receive such gifts. One of them said that the reason for willing to make a Memory Flipbook on her own is that: For example, when she does not know what gift to give on friends or family members' birthdays,

this seems to be a creative and thoughtful gift. And the reason why she wants to receive it is that she can think of and miss when she was a child and used textbooks to draw characters to make flipbooks by herself. And the fragments intercepted from the inside of such a flipbook can easily evoke memories with the gift-giver and can feel the gift-giver's heart.

Regarding the second question, 9 of the 10 interviewees are willing to try the Memory Flipbook application, and think that the Memory Flipbook looks interesting whether as a gift or as a souvenir, and just uploading the video to the platform without making it on their own seems very convenient, which is a boon for those who are not good at crafting.

Regarding the third question, three interviewees thought that this video shooting mode was indeed a bit troublesome, and others thought it was not troublesome. Another respondent thought that a specific recording device could be used instead of a mobile phone to take videos. An interviewee who does not think this video shooting mode is troublesome, she thinks that when people feel happy, they always hope that such a moment can be extended and preserved, and video recording is a very common method, as is also for couples to shoot each other. A natural activity for couples to get along. Moreover, with the increase in recordings of videos and photos, many of the captured memory clips are mixed with some useless materials and fall into dust on the phone. I often don't bother to look through the photos and videos on the phone because there are too many photos and videos on the phone. The memories of the past, even at the moment of shooting, I want to remember the memories of this moment forever. I think that being able to make such a physical memoir will make people look back on the touching moments of getting along with family, friends, and lovers.

For the fourth question, the way to use the first prototype is to hold the book with the left hand, flip the pages of the book with the thumb of the right hand, and view the contents of the front side in order from left to right. Then, turn to the reverse side, continue to hold the book with the left hand, flip the pages of the book with the right thumb, and continue to view the reverse content in the order from left to right. Three interviewees suggested that I could try a new layout mode. First hold the book with the left hand, flip the pages of the book with the thumb of the right hand, and view the contents of the front side in order from

left to right. Then hold the book with the right hand, flip the pages of the book with the thumb of the left hand, and view the contents of the reverse side in order from right to left. Another suggestion is that if there is a link when uploading a video on the application, user can choose any frame or multiple frames to paste stickers or doodles. It will feel very interesting (similar to the process of adding stickers or doodles after the photo is taken)

3.6.3 Revision

The results of the interview show that most of the interviewees think the Memory Flipbook is very interesting and can show the concept well, and they are willing to try to make a similar flipbook by themselves. Of course, some suggestions have been made. In the second prototype, I will try the new layout mode mentioned earlier, that is, first flip from left to right, and then flip from right to left. At the same time, the paper selection problem will also be considered in the comparison between the second prototype and the first prototype. Therefore, plain paper will be chosen in the second prototype.

3.7. The Second Prototype

The second prototype is different from the first one. The main purpose is to consider the paper choosing problem and try a new layout mode. The second prototype was made using videos of the my girlfriend and I.

3.7.1 Revised Making Steps

Step1: Shoot Videos

As illustrated in Figure 3.14, in this step, the second prototype uses two tourism videos of my girlfriend and I traveling in a park. The first video is a video taken by my girlfriend on her mobile phone, recording the scenery in her eyes, which is from the first perspective. The second video is a video taken by myself on my phone, recording my girlfriend in my eyes, which is from the third perspective. But this time I achieved shooting at the same time and in the same place, so the

person in the video was shooting with a mobile phone in her hand. Both of these two videos have 60 seconds long and are 1080p, 60fps.
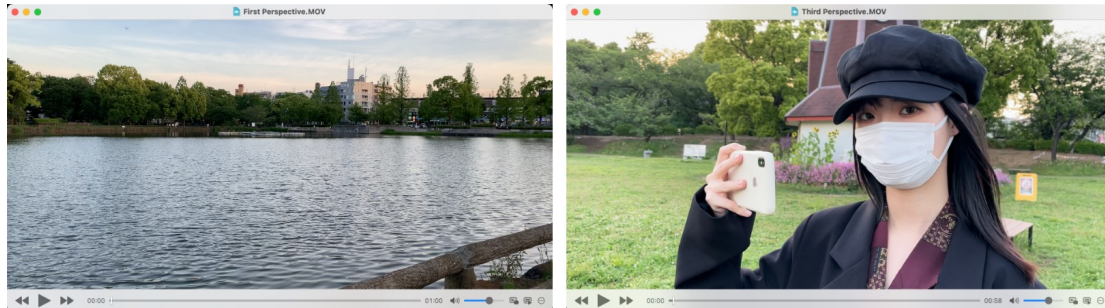
Figure 3.14 Step1 of the Second Prototype: Shoot Videos

Step2: Extract Pictures

I still use the Video Frames to Lays function of Adobe Photoshop to extract pictures. Since the video is 60 seconds and 60fps this time, I set to extract a picture to the layer every 45 frames, so a total of 80 pictures in 80 layers were extracted. Export all these pictures, which is shown in Figure 3.15.
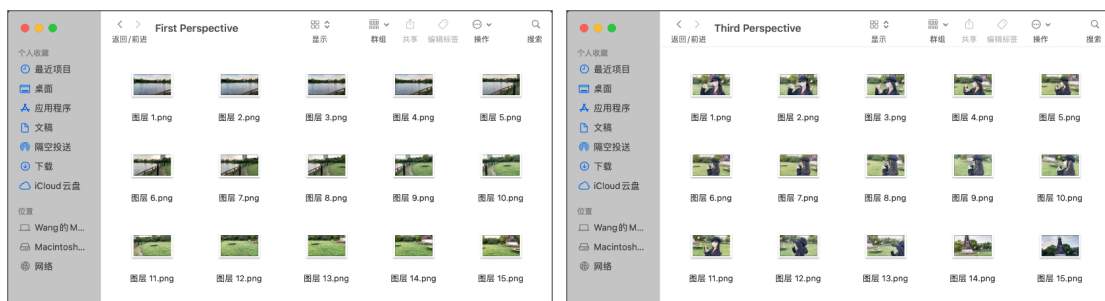
Figure 3.15 Step2 of the Second Prototype: Extract Pictures

Step3: Layout

In the second prototype, I tried a new layout mode, which is different from the previous layout. First of all, in order to make printing more convenient, in this

layout, I arranged all the pictures to be printed on the front and back sides in one pdf document. The odd-numbered pages, such as the first page, the third page, and the fifth page, arrange the pictures on the front side, and the even-numbered pages, such as the second page, the fourth page, and the sixth page, arrange the pictures on the back side.

At the same time, in order to achieve the expected flipping effect, I have made certain adjustments to the order of the pictures. The front of the first page of the flipbook is the first picture of the first video, the reverse side of it should be the last picture of the second video. In the same way, the front of the second page is the second picture of the first video, and its reverse side should be the penultimate picture of the second video, and so on.

Therefore, on the first page of the PDF file, from top to bottom are picture 1, picture 2, picture 3, and picture 4 of the first video. On the second page of the PDF file, from top to bottom, there are picture 80, picture 79, picture 78, picture 77 of the second video, and so on, which is illustrated in Figure 3.16. Only in this arrangement can the pictures correspond to each other, so as to achieve the expected flipping effect.
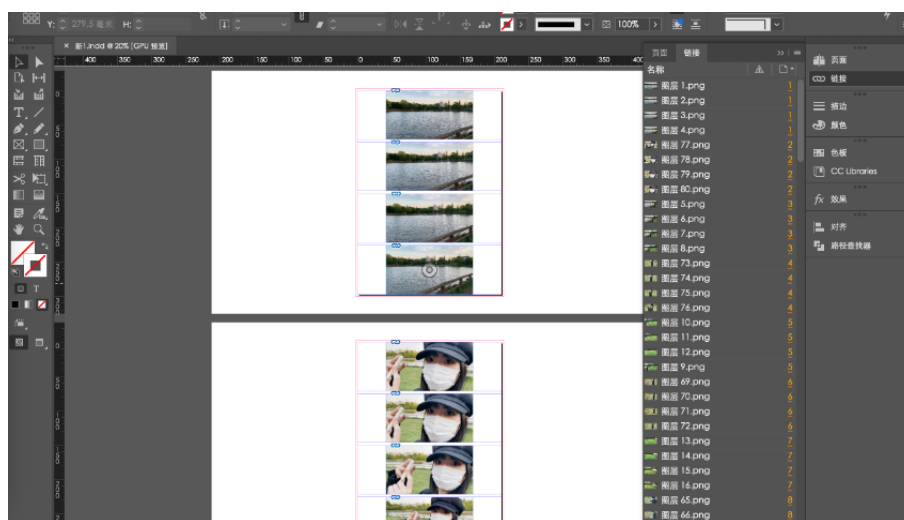
Figure 3.16 Step3 of the Second Prototype: Layout

Step4: Print, Crop and Bind

Like the previous prototype, I did this step in Kinko's. This time I chose plain paper for printing. I would like to compare the difference between thinner paper and thicker paper, that is, that is, the influence of paper thickness on the flipping effect. And due to the layout change, the printing steps were much more convenient.

Step5: Make a Cover

I still made a cover for the flipbook with kraft paper and glue. So far, as Figure 3.17 shows, the second prototype has been completed, the final size of the book is: length 13cm, width 7cm, thickness 0.8cm. Except for the video shooting and traffic time, the rest of the steps took a total of 150 minutes.

Figure 3.17 the Second Prototype

3.7.2 Testing and Results

The interview method was used in the second prototype test. This time the test was conducted offline, and I invited the four interviewees who had been interviewed offline in the first test again.

The purpose of the offline test is twofold, the first is to experience and evaluate the new layout mode, and the second is to experience and evaluate the new paper. The test method is to flip the first prototype and the second prototype in turn, and then evaluate which layout mode and paper thickness is better. Based on these two purposes, after the interviewees experienced the two prototypes in turn, I asked each of the four interviewees for their opinions, and their answers were

surprisingly consistent: Whether it was the layout mode or the paper thickness, they all felt that the first prototype was better.

For layout mode, the reason they prefer the first prototype is that, when flipping the second prototype, since the pictures on the left and the right are in one direction, they are often disturbed by the pictures on the left when viewing the content on the right, and are unable to concentrate on the animation generated by the right side. In contrast, when flipping the first prototype, since the pictures on the left side are reversed during the process of flipping the pages of the right side, the interference of the picture in the left side is not very strong, so that they can concentrate on the contents of the right side.

For the thickness of paper, they prefer thick paper. They said that thick paper is smoother when flipping, and they can adjust the speed according to their preferences. The thin paper is too soft, and sometimes even a lot of pages can be flipped at once, and a complete animation cannot be formed.

3.7.3 Revision

The results of the interview showed that the all the interviewees believed that the initial layout mode and thick paper had a better experience and displayed clear animations when flipping. Therefore, in the third prototype, the initial layout mode and thick paper will still be selected. At the same time, the interviewee's video instead of my video will be used to make the third prototype, allowing the interviewee to experience the Memory Flipbook made with their own video.

3.8. The Third Prototype

The third prototype is different from the first two. The interviewee's video will be used instead of my videos. The main purpose is to let the interviewees personally experience the Memory Flipbook made with their own videos, and give comments and suggestions for improvement.

3.8.1 Revised Making Steps

Step1: Shoot Videos

In this step, the third prototype uses two videos of two interviewees walking by the lake. The two interviewees are lovers, so they are suitable candidates for making Memory Flipbook. They were familiar with the concept of Memory Flipbook as they had already conducted two rounds of testing before. Except for the recommendation that the video should not be longer than 90 seconds, I did not make any requirements for them to shoot the video, so they were free to record the scenery and people they wanted to record.

As illustrated in Figure 3.18, the first video is a video taken by the girl on her mobile phone, recording the scenery and her boyfriend in her eyes, which is from the third perspective. The second video is a video taken by the boy on his phone, recording the scenery in his eyes, which is from the first perspective. The two videos, like the second prototype, were shot at the same time and in the same place, with the person appearing in the video holding a cell phone in his hand. Both of these two videos have 90 seconds long and are 1080p, 60fps.
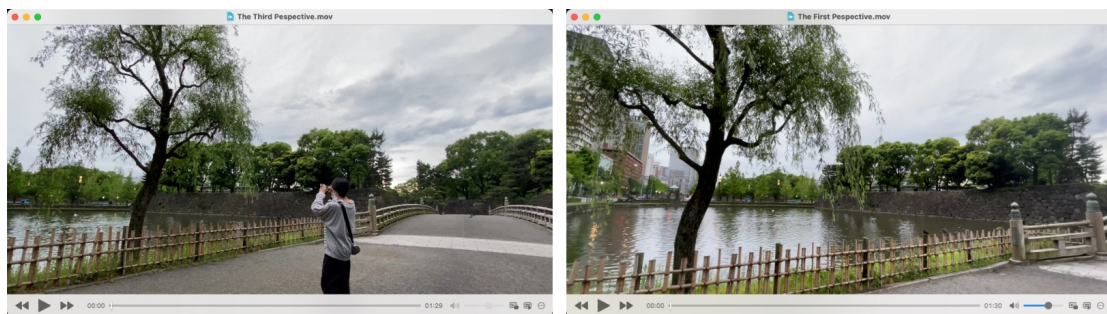
Figure 3.18 Step1 of the Third Prototype: Shoot Videos

Step2: Extract Pictures

I still use the Video Frames to Lays function of Adobe Photoshop to extract pictures. Since the video is 60 seconds and 60fps this time, I set to extract a picture to the layer every 67 frames, so a total of 80 pictures in 80 layers were extracted. Export all these pictures, which is shown in Figure 3.19.
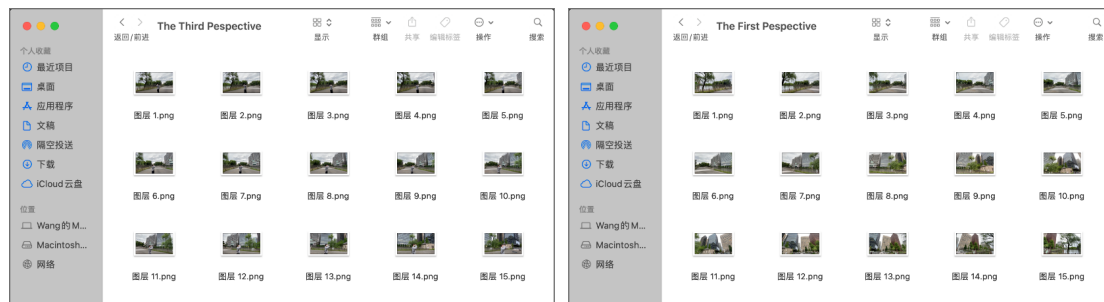
Figure 3.19 Step2 of the Third Prototype: Extract Pictures

Step3: Layout

In the third prototype, I used the same layout mode as the first prototype. Using Adobe Indesign, 80 pictures exported from the first video arranged in a document, and 80 pictures exported from the second video arranged in another document, the picture of these size is 126mm long, 71mm wide, spacing of 4mm, then export the two documents into PDF files, which is illustrated in Figure 3.20.
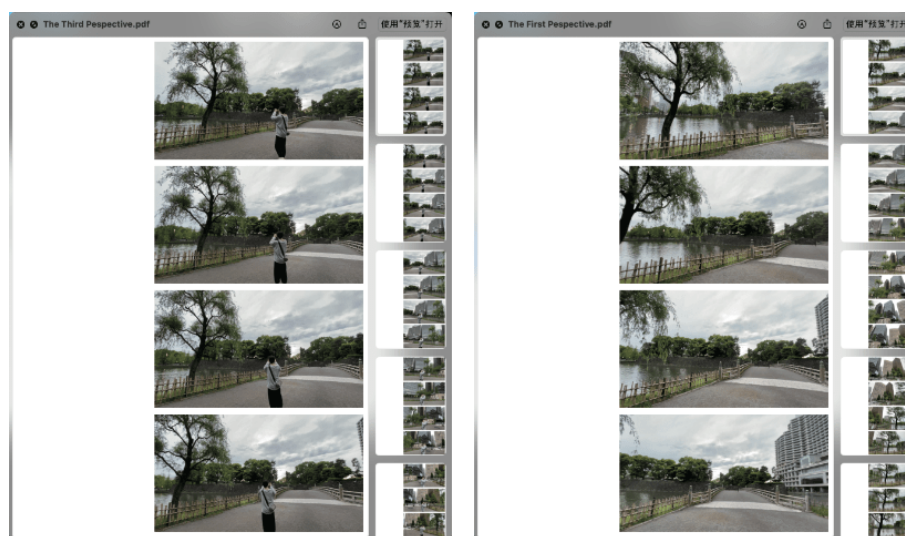
Figure 3.20 Step3 of the Third Prototype: Layout

Step4: Print, Crop and Bind

Like the previous prototypes, I did this step in Kinko's. The third prototype is the same as the first prototype in terms of paper choosing, using thick paper, and the layout mode and usage method are also the same: Hold the book with the left hand, flip the pages of the book with the thumb of the right hand, and view the contents of the front side in order from left to right. Then, turn to the reverse side, continue to hold the book with the left hand, flip the pages of the book with the right thumb, and continue to view the reverse content in the order from left to right.

Step5: Make a Cover

After communicating with the two interviewees, they wanted a pure black cover, so I used black thick paper and glue to make a handmade cover. So far, as Figure 3.21 shows, the third prototype has been completed, the final size of the book is: length 12.6cm, width 7cm, thickness 1cm. Except for the video shooting and traffic time, the rest of the steps took a total of 150 minutes.

Figure 3.21 the Third Prototype

3.8.2 Testing and Results

Since the third prototype was made using the videos of two interviewees in the last test, the interviewees this time were also the two video providers, and the test was conducted in the form of in-depth interview.

The in-depth interview mainly focuses on three aspects, each of which has 3 more detailed questions:

The Flipping Experience:

- Is the paper easy to flip?

- Can you adjust the flipping speed according to your preferences?

- Is the animation smooth?

Flipbook Making:

- Whether the size is convenient for storage and carrying?

- Whether the printing meets expectations?

- Is the cover satisfied?

The Display Effect of Memories:

- Can the animation be viewed in its entirety?

- Can flipbook allow you to recall your memories at that time?

- Can flipbook allow you to know the other half's memories at the same time?

The girl's answer is as follows: The thick paper has a good flipping feel, and the flipping speed can be adjusted freely, and the animation seen during the flipping process is also very smooth. The flipbook is easy to store in size, but not easy to carry, but she has no intention of carrying it and she intends to store it in the shelf. There is almost no difference between the printed color and the video. As for the black cover, she was satisfied because she chose it herself.

However, the video cannot be seen completely. When flipping the page on the right and looking at the content, the left side of the picture cannot be seen completely. The flipbook can indeed recall her memories at the time. And when she turned to the reverse side and looked at the content, she could know the memories of the boy at the same moment, which was great. The girls are generally very satisfied with this Memory Flipbook.

The boy's answer was basically the same as the girl's answer, but he said that: Because the weather was cloudy when the video was taken, the overall color of the

flipbook was slightly darker due to the video, and the details were not particularly good. In addition, since he has no obvious movement changes in the video, the effect of the animation is a bit monotonous.

3.8.3 Revision

The interview results show that the parts that the interviewees think need improvement are all focused on the video: First, if the main person appears on the left side of the video, it will not be easily seen when flipping the book, so there is a need to properly flow out the blank space on the left side of the video to facilitate users to distinguish the front and back sides of the video on the one hand, and to shift the overall position of the video to the right on the other hand, so that it can be better seen in its entirety. Secondly, the color of the video determines the overall color of the flipbook, so the location with better light and higher brightness should be chosen when shooting the video. Third, it is better to have more obvious changes in the person and scenery in the video, otherwise the animation effect produced by flipping the flipbook will be monotonous. Other than that, the other features of the third prototype are satisfactory.

Therefore, in the production of the next prototype, the following options should be chosen: Choose thick paper in order to flip easily and free to adjust the flipping speed; Set the flipbook size to 15cm long and 7cm wide for easy flipping and collection; Select the layout mode of flipping the book from the front side, then turning to the reverse side, and then flipping the book from the reverse side. As well as the most important video shooting session, attention should be paid to the issues mentioned above.

Chapter 4
Proof of Concept

4.1. the Fourth Prototype

4.1.1 Making Steps

Shoot Videos

As illustrated in Figure 4.1, in this step, two videos taken by the other two inter-viewees during a beach trip were used in the fourth prototype. The first video is a video taken by the girl on her mobile phone, recording the scenery in her eyes, which is from the first perspective. The second video is a video taken by the boy on his phone, recording the girl in his eyes, which is from the third perspective.

Because this couple don't want the mobile phone to appear in the video, which will make the girl's motion more beautiful and natural, they chose the same shoot-ing method as my first prototype: the girl shot the first video first, remembering the path, motions, and time taken during the shooting. After that, the boy shot the second video of the girl walk through the same road with the same path, movement, and time. Use this method to simulate shooting at the same time and place, so as not to let the mobile phone appear on the screen.

At the same time, in the process of shooting the second video for the boy, he placed the girl on the right side of the screen as much as possible, so that when flipping the book, the girls' movements and expressions will be seen clearly and completely. Both of these two videos have 41 seconds long and are 1080p, 60fps.

Extract Pictures

To make the animation generated when flipping smoother, in the fourth prototype I reduced the frame interval and extract more pictures. I still use the Video Frames
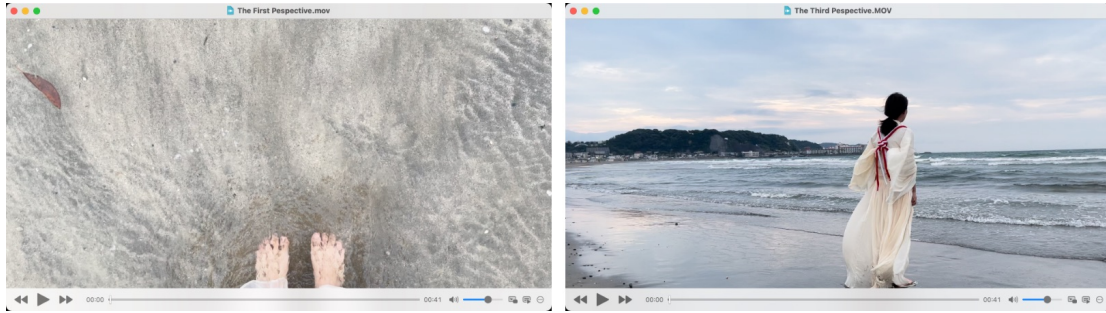
Figure 4.1 Step1 of the Fourth Prototype: Shoot Videos

to Lays function of Adobe Photoshop to extract pictures. Since the video is 41 seconds and 60fps this time, I set to extract a picture to the layer every 25 frames, so a total of 99 pictures in 99 layers were extracted. Export all these pictures, which is shown in Figure 4.2.
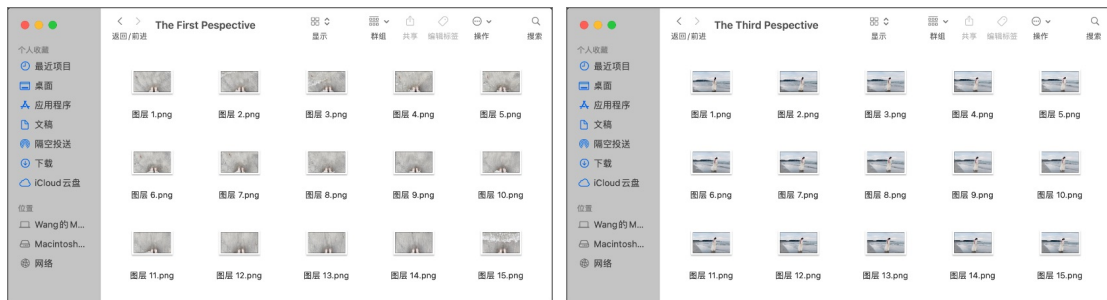
Figure 4.2 Step2 of the Fourth Prototype: Extract Pictures

Layout

The layout mode of the fourth prototype is the same as the first and third, which are both flipping the book from the front side, then turning to the reverse side, and then flipping the book from the reverse side.

In order to make printing more convenient this time, in Adobe Indesign, I arranged 198 pictures extracted from two videos in the same document, arranged 4 pictures on each A4 layout, the size of these pictures is 123mm long, 69mm wide, and spacing of 4mm. The odd-numbered pages are arranged in positive order

for the first video extracted image, and the even-numbered pages are arranged backwards for the second video extracted image, and the images on the even-numbered pages are rotated by 180 degrees to achieve the desired flipping effect and simplify the printing process, which is illustrated in Figure 4.3.
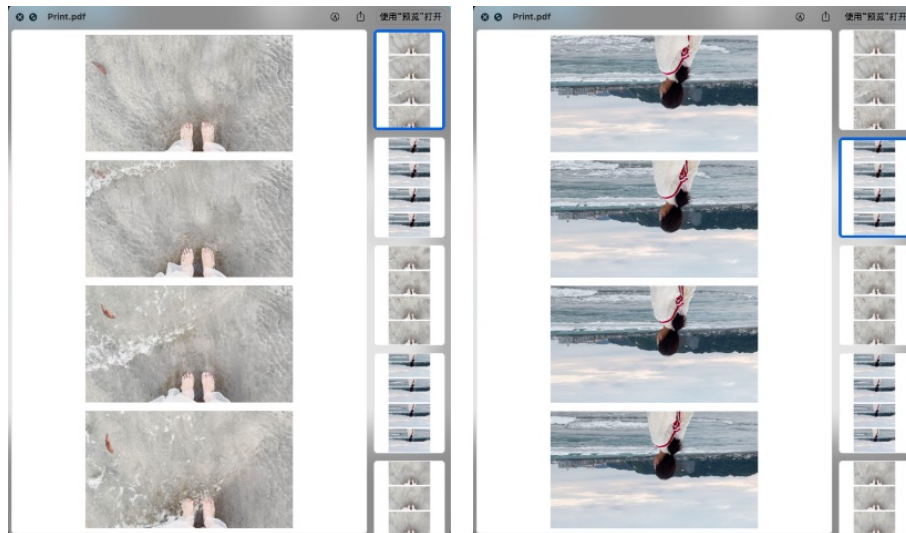
Figure 4.3 Step3 of the Fourth Prototype: Layout

Print, Crop and Bind

Like the previous prototype, I did this step in Kinko's. This time I chose thick paper for printing, and the paper weight is 183 gram per square meter. And because all the pictures are arranged in a PDF document in order, the printing process is more convenient.

Make a Cover

In previous interviews with the two interviewees, they stated that the cover of kraftpaper is softer and easier to flip than the black cover, so they chose kraftpaper as the cover. Therefore I used kraftpaper and glue to make a handmade cover. So far, as Figure 4.4 shows, the fourth prototype has been completed, the final size of the book is: length 15cm, width 7cm, thickness 2cm.

Figure 4.4 the Fourth Prototype

4.1.2 Usage Method

Memory flipbook is also a flipbook, so there is no big difference in the way of using it: The user does not have to "read" from left to right, but only needs to stare at the same position of the images in the flipbook when turning the page. The flipbook must be flipped through at sufficient speed for the illusion to work, so the standard way to "read" flipbook is to hold the booklet with one hand and flip through the pages with the thumb of the other hand.

As for the fourth prototype, users should hold the book with the left hand and flip through the pages with the thumb of the right hand to view the content of the right pages, then turn to the reverse side, and keep the same way to watch the content on the reverse pages.

4.2. Questionnaire and Analysis

In order to explore whether people are interested in Memory Flipbook and whether they will try to use its online making application, I designed a questionnaire survey through Tencent Questionnaires. Figure A.1, Figure A.2, Figure A.3, Figure A.4 in the appendix shows all the questions and options. The questionnaire is divided into three parts. The first part is the collection of basic information: gender, age, educational background and occupation. The second part is to collect people's way and frequency of recording life, the experience of materializing the medium of memory, the characteristics of the gift they want to receive, and the experience of DIY gifts. The third part first collects people's familiarity with flipbook, and after introducing Memory Flipbook and its online making application, explore the

user's interest in it, indicators of concern, and ideal price range through questions. In the third part, I show them the concept pictures and a prototype video to make them understand the concept. The first prototype and fourth prototype are used in the video, and the video also shows how to use the flipbook and the flipping effects of the two prototypes. Texts, pictures, and video are used in order to make people fully understand Memory Flipbook as much as possible.

After completing the design of the questionnaire, I shared the questionnaire link to the WeChat Moments and asked my WeChat friends to fill out the questionnaire. Moreover, my WeChat friends also helped me share the questionnaire link to their WeChat Moments. Two days later, a total of 341 valid questionnaires were received. The recovery rate was 77% and the average completion time was 2 minutes and 41 seconds. The results of the key questions in the questionnaire are shown below:

Question 11: Would you be willing to try this Memory Flipbook making application?

In Question 11, I introduced Memory Flipbook and its making application like this: The goal of the Memory Flipbook project is to design a kind of flipbook that can embody videos to show personal memories and interaction with other people's memories. An application that can make this kind of flipbook online will also be designed. The application will provide two services : Single side flipbook, users can upload a favorite video or a commemorative video on the application. The application will automatically process this video, print and make it in a flipbook, and mail the flipbook to the user. Double side flipbook, users can upload two videos of themselves and their family, friends and lovers to the application. The application will automatically process the two videos, print and make them in a flipbook, and mail the flipbook to the user. Then I asked the question: Would you be willing to try this Memory Flipbook making application?

As Figure 4.5 shows, 107 people said they wanted to use the application to make a single side flipbook, accounting for 31.4%; 164 people said they wanted to use the application to make a double side flipbook, accounting for 48.1%; Only 70 people said they would not try, accounting for 20.5%.
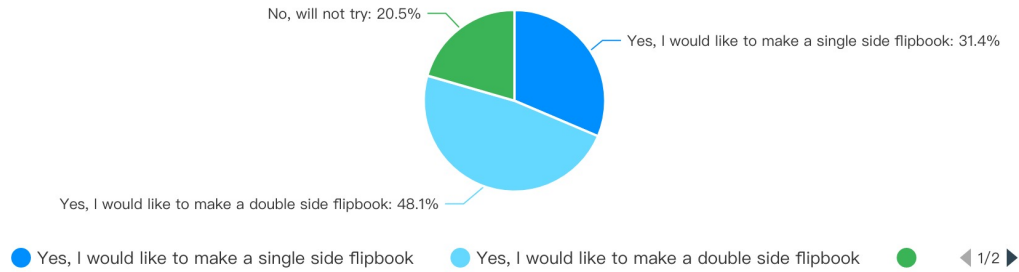
Figure 4.5   Question 11: Would you be willing to try this Memory Flipbook making application?

Question 12: Would you like to make or receive such a Memory Flipbook?

In Question 12, I provided a video showing the fourth prototype, and then I asked the question: Would you like to make or receive such a Memory Flipbook?

As Figure 4.6 shows, 104 people said they wanted to make a similar double side flipbook, accounting for 30.5%; 178 people said they wanted to receive a similar double side flipbook, accounting for 52.2%; Only 59 people said that they did not want to make or receive, accounting for 17.3%.

Question 13: If you are interested in Memory Flipbook, please choose the three indicators you care about most

In Question 13, I provided 6 indicators of Memory Flipbook, and let people interested in it choose 3 indicators of most concern.

As Figure 4.7 shows, animation fluency, paper texture and printing quality are the most concerned indicators, 71.6%, 66.9% and 59.8% of the people choose. Next are price and shipping, production cycle and size, 28.7%, 20.5% and 15.8% of people choose. In addition, 26 people are not interested in Memory Flipbook, accounting for 7.6%.

No: 17.3%

Yes, I would like make one by myself: 30.5%

Yes, I would like to receive one: 52.2%

● Yes, I would like make one by myself   ● Yes, I would like to receive one   ● No
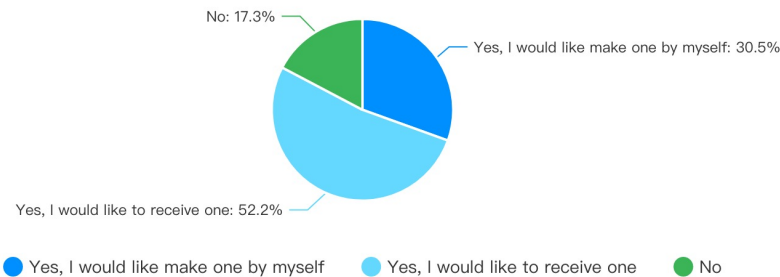
Figure 4.6   Question 12: Would you like to make or receive such a Memory Flipbook?

71.6%   66.9%   59.8%   28.7%

15.8%   20.5%   7.6%

Animation fluency   Paper texture   Printing quality   Size   Production cycle   Price and shippin ...   Not interested
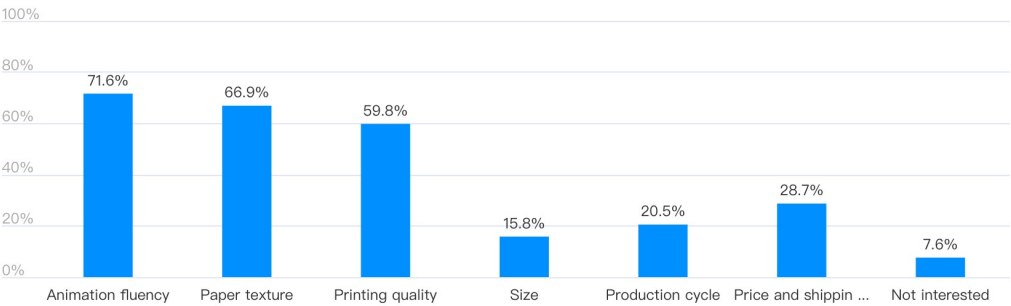
Figure 4.7 Question 13: If you are interested in Memory Flipbook, please choose the three indicators you care about most

4.2.1 Cross analysis

Question6 and Question1

The question of Question6 is that "How often do you record your life", and the options are "Many times a day", "Once a day", "Once a week", "Once a month" and "Almost never". And the question of Question1 is that "What's your gender", and the options are "Male", "Female" and "Others". As shown in Table 4.1, the result of chi-square test between Question6 and Question1 with SPSS is below:

The proportion of Female choosing Option1 "Many times a day" is 25.8%, which is significantly higher than the average level of 20.8%. The proportion of Female choosing Option2 "Once a day" is 25.8%, which is significantly higher than the average of 20.5%. The proportion of Male choosing Option4 "Once a month" is 24.4%, which is significantly higher than the average of 16.4%. The P value of the gender and Question6 "How often do you record your life" is 0.000, which is lower than 0.01, so there is a significant difference between these two factors, that is, the frequency of men and women recording life is completely different.

Table 4.1   Chi-square Analysis between Question6 and Question1

Chi-Square Analysis							
Items	Categories	What's your gender?(%)			Total	$\tilde{\chi}^2$	p
		Male	Female	Others			
Q6	Many times a day	15(11.8)	55(25.8)	1(100)	71(20.8)	45.553	0.000**
	Once a day	15(11.8)	55(25.8)	0(0)	70(20.5)		
	Once a week	48(37.8)	74(34.7)	0(0)	122(35.8)		
	Once a month	31(24.4)	25(11.7)	0(0)	56(16.4)		
	Almost never	18(14.2)	4(1.9)	0(0)	22(6.5)		
Total		127	213	1	341		
* p<0.05 ** p<0.01							

Question11 and Question1

The question of Question11 is that "Would you be willing to try this Memory Flipbook making application", and the options are "Yes, I would like to make a single side flipbook", "Yes, I would like to make a double side flipbook" and "No,

will not try". And the question of Question1 is that "What's your gender", and the options are "Male", "Female" and "Others". As shown in Table 4.2, the result of chi-square test between Question11 and Question1 with SPSS is below:

The proportion of Female choosing Option1 "Yes, I would like to make a double side flipbook" is 55.4%, which is significantly higher than the average level of 48.1%. The proportion of Male choosing Option2 "No, will not try" is 27.6%, which is significantly higher than the average of 20.5%. The P value of the gender and Question11 "Would you be willing to try this Memory Flipbook making application" is 0.005, which is lower than 0.01, so there is a significant difference between these two factors, that is, there are significant differences between men and women in the type of Memory Flipbook they try to make and whether they will use this application.

Table 4.2 Chi-square Analysis between Question11 and Question1

Chi-Square Analysis							
Items	Categories	What's your gender?(%)			Total	$\tilde{\chi}^2$	p
		Male	Female	Others			
Q11	Yes, single side flipbook	46(36.2)	60(28.2)	1(100)	107(31.4)	14.721	0.005**
	Yes, double side flipbook	46(36.2)	118(55.4)	0(0)	164(48.1)		
	No, will not try	35(27.6)	35(16.4)	0(0)	70(20.5)		
Total		127	213	1	341		
* p<0.05 ** p<0.01							

Question11 and Question6

The question of Question11 is that "Would you be willing to try this Memory Flipbook making application", and the options are "Yes, I would like to make a single side flipbook", "Yes, I would like to make a double side flipbook" and "No, will not try". And the question of Question6 is that "How often do you record your life", and the options are "Many times a day", "Once a day", "Once a week", "Once a month" and "Almost never". As shown in Table 4.3, the result of chi-square test between Question11 and Question6 with SPSS is below:

For those who chose Option2 "Once a day" in Question6, the proportion of those who chose Option1 "Yes, I would like to make a single side flipbook" in Question11 is 41.4%, which is significantly higher than the average level of 31.4%.

For those who chose Option1 "Many times a day" in Question6, the proportion of those who chose Option2 "Yes, I would like to make a double side flipbook" in Question11 is 64.8%, which is significantly higher than the average. 48.1%. Those who chose Option5 "Almost never" in Question6, the proportion of those who chose option3 "No, will not try" in Question11 is 50.0%, which is significantly higher than the average level of 20.5%.

The P value of Question11 "Would you be willing to try this Memory Flipbook making application?" and Question6 "How often do you record your life" is 0.002, which is lower than 0.01, so there is a significant difference between these two factors. In other words, people who record their lives more frequently are more likely to like double side flipbooks, and people who don't like to record their lives are more likely to be disinterested in Memory Flipbook.

Table 4.3 Chi-square Analysis between Question11 and Question6

Chi-Square Analysis									
Items	Categories	How often do you record your life ?(%)					Total	$\tilde{\chi}^2$	p
		Many times a day	Once a day	Once a week	Once a month	Almost never			
Q11	Yes, single side flipbook	15(21.1)	29(41.4)	37(30.3)	20(35.7)	6(27.3)	107(31.4)	24.34	0.002**
	Yes, double side flipbook	46(64.8)	29(41.4)	60(49.2)	24(42.9)	5(22.7)	164(48.1)		
	No, will not try	10(14.1)	12(17.1)	25(20.5)	12(21.4)	11(50.0)	70(20.5)		
Total		71	70	122	56	22	341		
* p<0.05 ** p<0.01									

Question11 and Question8

The question of Question11 is that "Would you be willing to try this Memory Flipbook making application", and the options are "Yes, I would like to make a single side flipbook", "Yes, I would like to make a double side flipbook" and "No, will not try". And the question of Question8 is that "What kind of gift would you most like to receive", and the options are "Practical", "Thoughtfully chosen or created by the gift giver", "Expensive or famous brand" and "Novel or creative". As shown in Table 4.4, the result of chi-square test between Question11 and Question8 with SPSS is below:

For those who chose Option3 "Expensive or famous brand" in Question8, the proportion of those who chose Option3 "No, will not try" in Question11 is 40.0%, which is significantly higher than the average level of 20.5%. For those who chose Option1 "Practical" in Question8, the proportion of those who chose Option3 "No, will not try" in Question11 is 27.9%, which is significantly higher than the average. 20.5%.

The P value of Question11 "Would you be willing to try this Memory Flipbook making application?" and Question8 "What kind of gift would you most like to receive? " is 0.03, which is lower than 0.05, so there is a significant difference between these two factors. In other words, people who like practical or expensive gifts are more likely not to be interested in Memory Flipbook.

Table 4.4 Chi-square Analysis between Question11 and Question8

Chi-Square Analysis								
Items	Categories	What kind of gift would you most like to receive?(%)				Total	$\tilde{\chi}^2$	p
		Practical	Thoughtfully chosen or created	Expensive or famous brand	Novel or creative			
Q11	Yes, single side flipbook	29(27.9)	51(34.5)	6(30.0)	21(30.4)	107(31.4)	13.943	0.030*
	Yes, double side flipbook	46(44.2)	78(52.7)	6(30.0)	34(49.3)	164(48.1)		
	No, will not try	29(27.9)	19(12.8)	8(40.0)	14(20.3)	70(20.5)		
Total		104	148	20	69	341		
* p<0.05 ** p<0.01								

Question11 and Question9

The question of Question11 is that "Would you be willing to try this Memory Flipbook making application", and the options are "Yes, I would like to make a single side flipbook", "Yes, I would like to make a double side flipbook" and "No, will not try". And the question of Question9 is that "Have you ever had the experience of DIY gifts", and the options are "Yes, I have done it by myself", "Yes, I have done it on Taobao, "Shiqi" and other Apps that can DIY gifts", "No, but I would like to DIY one" and "No, and do not want to do it at all". As shown in Table 4.5, the result of chi-square test between Question11 and Question9 with SPSS is below:

For those who chose Option2 "Yes, I have done it on Taobao, "Shiqi" and other Apps that can DIY gifts" in Question9, the proportion of those who chose Option3 "Yes, I would like to make a double side flipbook" in Question11 is 61.9%, which is significantly higher than the average level of 48.1%. For those who chose Option4 "No, and do not want to do it at all" in Question9, the proportion of those who chose Option3 "No, will not try" in Question11 is 66.0%, which is significantly higher than the average 20.5%.

The P value of Question11 "Would you be willing to try this Memory Flipbook making application?" and Question9 "Have you ever had the experience of DIY gifts?" is 0.000, which is lower than 0.01, so there is a significant difference between these two factors. In other words, those who have experienced DIY gifts may be more interested in the double side flipbook. People without DIY gift experience are more likely not interested in Memory Flipbook.

Table 4.5 Chi-square Analysis between Question11 and Question9

Chi-Square Analysis								
Items	Categories	Have you ever had the experience of DIY gifts?(%)				Total	$\tilde{\chi}^2$	p
		Yes, I have done it by myself	Yes, I have done it on Taobao, "Shiqi"	No, but I would like to DIY one	No, and do not want to do it at all			
Q11	Yes, single side flipbook	70(34.8)	7(33.3)	24(36.4)	6(11.3)	107(31.4)	80.889	0.000**
	Yes, double side flipbook	105(52.2)	13(61.9)	34(51.5)	12(22.6)	164(48.1)		
	No, will not try	26(12.9)	1(4.8)	8(12.1)	35(66.0)	70(20.5)		
Total		201	21	66	53	341		
* p<0.05 ** p<0.01								

Question11 and Question10

The question of Question11 is that "Would you be willing to try this Memory Flipbook making application", and the options are "Yes, I would like to make a single side flipbook", "Yes, I would like to make a double side flipbook" and "No, will not try". And the question of Question10 is that "Do you know about the flipbook", and the options are "Yes, I painted by myself", "Yes, not painted but very familiar", "Yes, heard of it but not familiar with it" and "No, never heard

of that". As shown in Table 4.6, the result of chi-square test between Question11 and Question10 with SPSS is below:

For those who chose Option1 "Yes, I painted by myself" in Question10, the proportion of those who chose Option2 "Yes, I would like to make a double side flipbook" in Question11 is 53.9%, which is significantly higher than the average level of 48.1%. For those who chose Option1 "Yes, I painted by myself" in Question10, the proportion of those who chose Option3 "No, will not try" in Question11 is 25.6%, which is significantly higher than the average level of 20.5%. For those who chose Option4 "No, never heard of that" in Question10, the proportion of those who chose Option3 "No, will not try" in Question11 is 41.8%, which is significantly higher than the average level of 20.5%.

The P value of Question11 "Would you be willing to try this Memory Flipbook making application?" and Question10 "Do you know about the flipbook?" is 0.001, which is lower than 0.01, so there is a significant difference between these two factors. In other words, people who have drawn flipbooks by themselves before may be particularly interested in Memory Flipbook, or they may have no interest in Memory Flipbook. People who have never heard of flipbook may not be interested in Memory Flipbook.

Table 4.6 Chi-square Analysis between Question11 and Question10

Chi-Square Analysis							
Items	Categories	Do you know about the flipbook?(%)				Total	$\tilde{\chi}^2$	p
		Yes, I painted by myself	Yes, not painted but very familiar	Yes, heard of it but not familiar with it	No, never heard of that			
Q11	Yes, single side flipbook	8(20.5)	47(35.6)	40(34.8)	12(21.8)	107(31.4)	22.886	0.001**
	Yes, double side flipbook	21(53.9)	67(50.8)	56(48.7)	20(36.4)	164(48.1)		
	No, will not try	10(25.6)	18(13.6)	19(16.5)	23(41.8)	70(20.5)		
Total		39	132	115	55	341		
* p<0.05 ** p<0.01								

Question12 and Question9

The question of Question12 is that "Would you like to make or receive such a Memory Flipbook", and the options are "Yes, I would like make one by myself", "Yes, I would like to receive one" and "No". And the question of Question9 is that "Have you ever had the experience of DIY gifts", and the options are "Yes, I have done it by myself", "Yes, I have done it on Taobao, "Shiqi" and other Apps that can DIY gifts", "No, but I would like to DIY one" and "No, and do not want to do it at all". As shown in Table 4.7, the result of chi-square test between Question12 and Question9 with SPSS is below:

For those who chose Option1 "Yes, I have done it by myself" in Question9, the proportion of those who chose Option1 "Yes, I would like make one by myself" in Question12 is 36.3%, which is significantly higher than the average level of 30.5%. For those who chose Option2 "Yes, I have done it on Taobao, "Shiqi" and other Apps that can DIY gifts' in Question9, the proportion of those who chose Option2 "Yes, I would like to receive one" in Question12 is 71.4%, which is significantly higher than the average level of 52.2%. For those who chose Option4 "No, and do not want to do it at all" in Question9, the proportion of those who chose Option3 "No" in Question12 is 45.3%, which is significantly higher than the average level of 17.3%.

The P value of Question12 "Would you like to make or receive such a Memory Flipbook? " and Question9 "Have you ever had the experience of DIY gifts?" is 0.000, which is lower than 0.01, so there is a significant difference between these two factors. In other words, those who have DIY gifts by themselves before will be more likely to want to make a Memory Flipbook; those who have previously used software to DIY gifts will be more likely to want to receive a Memory Flipbook; those who have never planned to DIY gifts will be more likely May not be interested in Memory Flipbook.

4.2.2 Discussion

Based on the above questionnaire results and related analysis, a preliminary conclusion can be drawn. Among the 341 interviewed, 80% are willing to try to use the Memory Flipbook making application to make a single side flipbook or double

Table 4.7 Chi-square Analysis between Question12 and Question9

Chi-Square Analysis								
Items	Categories	Have you ever had the experience of DIY gifts?(%)				Total	$\tilde\chi^2$	p
		Yes, I have done it by myself	Yes, I have done it on Taobao , "Shiqi"	No, but I would like to DIY one	No, and do not want to do it at all			
Q12	Yes, I would like to make one by myself	73(36.3)	6(28.6)	18(27.3)	7(13.2)	104(30.5)	42.03	0.000**
	Yes, I would like to receive one	105(52.2)	15(71.4)	36(54.6)	22(41.5)	178(52.2)		
	No	23(11.4)	0(0)	12(18.2)	24(45.3)	59(17.3)		
	Total	201	21	66	53	341		
* p<0.05 ** p<0.01								

side flipbook. Among them, female, people who like to record their lives, people who have experience of DIY gifts, and people who have heard of flipbooks are more likely to be interested in Memory Flipbook; Male, people who like practical or high-value gifts, people who have never thought of DIY gifts and people who have never heard of flipbooks are more likely not to be interested in Memory Flipbook. Among interested people, the top three flipbook indicators that they pay most attention to are animation fluency, paper texture and printing quality.

The results of the questionnaire are basically the same as expected. The only surprise is that people who have drawn flipbooks by themselves are more likely not to be interested in Memory Flipbook. Through analysis, it may be because they have drawing ability and sufficient time, so they don't need Memory Flipbook making application to make flipbooks, they would like to draw one themselves.

4.3. Interview and Discussions

Since the questionnaire can only display the text description and display video of the Memory Flipbook, people cannot actually access a Memory Flipbook, so further evaluation is still needed.

To further evaluate the effects of Memory Flipbook, I invited 10 interviewees to participate in the interviews. Interviewees included 7 girls and 3 boys. This interview is a complete offline interview. First, I introduce the Memory Flipbook project and briefly explain the concept and making process to them face to face.

Then let them flip the prototype by themselves. After that, I explain the two shooting modes mentioned in the second question. There are shooting modes that can be chosen during shooting. Mode 1 is the girl shoots the video first, remembering the path, actions, and time taken during the shooting. After that, the boy shoots the video of her walking the same road with the same path, action, and time. The feature of this mode is that the girl will not stare at the phone in the video, which is also the mode used in this prototype. Mode 2 is the couple shoots the videos at the same time and place for only one time. In this way, the person in the video will always be staring at the phone. Then I ask them the interview questions. The interview questions are as follows:

1) Do you like the Memory Flipbook and why?

2) When shooting the videos, would you choose mode 1 or mode 2? And why?

3) What do you think of the animation fluency of this flipbook?

4) What do you think of the paper texture of this flipbook?

5) What do you think of the printing quality of this flipbook?

6) The production cost of the flipbook is 6,000 yen. What do you think of this price?

7) The production cycle of the flipbook is about 2 days including video shooting. What do you think of this production cycle?

8) What do you think of the size of this flipbook?

The results of the interview are as follows:

Regarding the first question, "Do you like the Memory Flipbook and why", all the girls expressed their interests in Memory Flipbook and wanted to make or receive a similar one. A girl said she likes it because that "The Memory Flipbook allows me to see myself in the eyes of my boyfriend when I am watching the scenery, which is very creative. I am most interested in this, because I am curious about how I look in my boyfriend's eyes". Another girl said that "When I am shooting a video of the scenery, my boyfriend is shooting a video of me, which

makes me feel noticed and loved". One of the girls said that the reason for willing to make a Memory Flipbook on her own is that "This is a book that needs two people to make together, not the traditional gift made by only one person, so it can effectively develop our relationship". Also, one girl claimed that "My boyfriend and I can make a flipbook like this after every trip, so we can collect a whole series of memories, they are the fruit of love". As for the boys, the other three boys said that they would not take the initiative to make such a memory flipbook. But if girlfriend wants, he will cooperate and try the best.

Regarding the second question, five of the seven girls said that they would choose mode 1, that is, they don't want to keep staring at the screen in the video. A girl said, "As a girl who loves beauty, no scenery is more important than myself. I want to show my best state in front of the camera". Another girl said, "Since I have decided to make this flipbook together as a common gift with my boyfriend, it won't be troublesome. After all, good things take a long time". The other girl said that, "Taking the video of traveling, it's better not to keep staring at the screen for people who appear in the video. It is more interesting to look at the scenery and do more interaction in the video". Two of the seven girls said that they would choose mode 2. One of them said that this problem can be solved by using lifelogging cameras such as GoPro. People can shoot the videos at the same time and place, and the people who appear in the video will not always stare at the phone screen. As for the boys, the two said that they would choose mode 2 to save time. Another boy said that he can do both modes, depending on which one his girlfriend likes. When shooting the videos, people can choose the mode and equipment used to shoot the video according to their preferences.

For the remaining questions, these questions are the evaluation of the indicators of the flipbook, which is the indicators that people care about most of Memory Flipbook in the questionnaire. The fourth prototype has a good overall evaluation on the six indicators of animation fluency, paper texture, printing quality, price, production cycle, and size. Especially on the indicators that paper texture, printing quality, and size, 8 or more people thought it was great, so there is no need to adjust for these three indicators.

For animation fluency, a girl said that because her hands were too small and the prototype was too thick, she couldn't flip the page smoothly. Another boy

said that occasionally he would turn over a lot of pages at once, which caused the animation to be not smooth enough. Therefore, some adjustments may be needed, such as appropriately reducing the thickness, so that users with smaller hands can easily and conveniently flip.

For price, The price range that girls can accept is higher, 5000 to 7000 yen. The price range that boys can accept is relatively low, ranging from 2,000 to 4,000 yen. The current production cost is 6000 yuan, which is a bit too expensive. Since I am a personal customer and only print one book, the production cost is high. In the subsequent mass production, we can contact a large printing company to print and bind a large number of orders, which will effectively reduce the production cost. The production cost is best guaranteed to be around 4000 yuan that users expect.

For production cycle, the test subjects generally believe that the production of the prototype is fast. However, two boys said that they would be more satisfied if the flipbook could be completed within one day. It currently takes 2 days from shooting the video to getting the finished flipbook, and it does not include the time required for express delivery. Therefore, it is best to guarantee the production cycle within one day, that is, when the user uses the online application to make a Memory Flipbook, after the user places an order and pays, it takes up to 24 hours to print, cut, glue, and make covers.

4.4. Application for Making Memory Flipbook Online

4.4.1 Main Functions

In order to enable people to customize their own Memory Flipbook more conveniently, a demo of an online making application needs to be designed. The purpose of the demo is to show the main functions of the application and the making process of the Memory Flipbook.

The main functions of the home page are as shown in the Figure 4.8 below: Menu Bar is located at the top of the page and provides navigation, including products, samples, pricing, contact, FAQ, sign up and log in. The introduction

part will show a demo of Memory Flipbook and a brief introduction; The instruction part will explain the making process of Memory Flipbook with pictures and text. The Occasions part will introduce the purpose and usage scenarios of Memory Flipbook; And the message dialog function, providing a button that is always floating on the page, click to display the chat window so that the customer service staff can be contacted at any time.
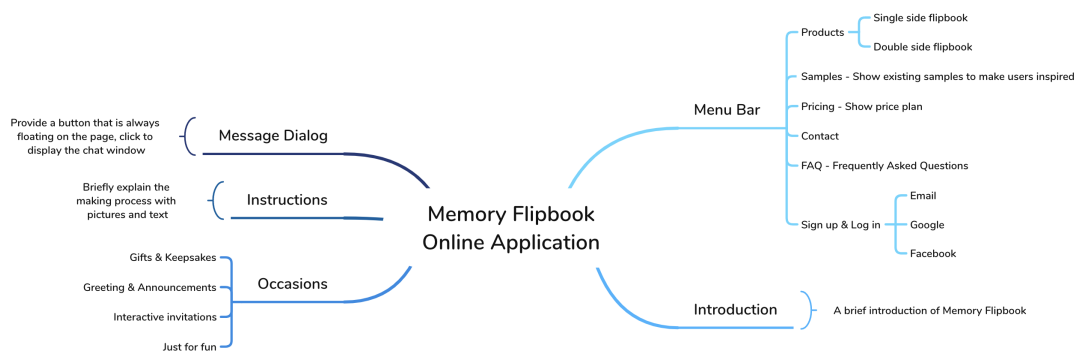

Figure 4.8 Main Functions of Memory Flipbook Online Application

After the user clicks the button "Try for free" and successfully logs in, the making process of the flip book will begin, which is shown in Figure 4.9. In the next section, each step will be explained through the UI design of the page.
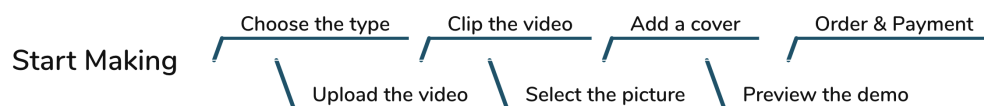

Figure 4.9 Steps of Making Memory Flipbook

4.4.2 UI/UX Design

Home page

Figure 4.10 is the UI design of the homepage, the page size is 1920 and 3290 pixels.

Sign up and Log in

Figure 4.11 shows all the UI designs of the making steps. When the user clicks any Try for free button on the homepage, or the Log in button in the Menu bar, it will jump to the Sign up or Log in page. This page provides three log in and sign up methods: Email, Google and Facebook.

Step1: Choose the Type

After successfully logging in to the account, the page will directly jump to the welcome page, and the user can choose a type of flipbook that he wants to do and start the making steps. There are currently two types of flipbooks available for making: single side flipbook and double side flipbook.

Step2: Upload the Video

According to the type of Memory Flipbook that the user chooses to make, jump to the making page of the flipbook. The step is to upload the video. A single side flipbook needs to upload one video, and a double side flipbook needs to upload two videos. The user can choose to click the button or drag the file into the box to upload the video file. During the video upload process, the file name and upload progress will be displayed below. After the video upload is complete, click the Next button to enter the video clipping page.

Step3: Choose a Video Clip

On this page, users can select a suitable video clip by moving the controls below the video. After the selection is complete, click the Next button to enter the picture selecting page. If the type of flipbook making is a double side flipbook, the user needs to select two video clips with the same length in turn.
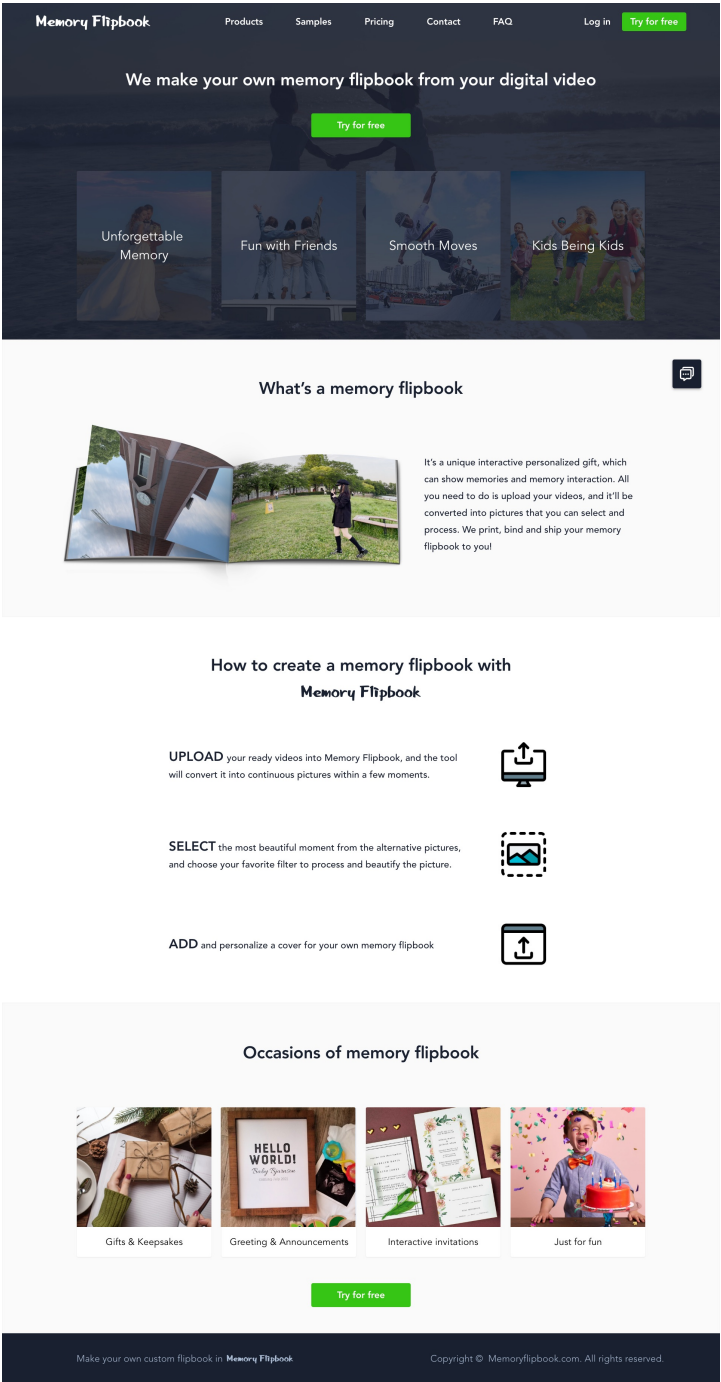
Figure 4.10 Home page

Step4: Select the Picture

After a period of waiting, the application automatically extracts a series of pictures from the selected video clips. What the user needs to do now is to replace the unsatisfied pictures from the candidate pictures according to their own preferences. If the flipbook type of making is a double side flipbook, the user needs to adjust the pictures of the two videos in turn.

Step5: Add a Cover

On this page, similar to the video uploading page, users can choose to upload a picture they want as the cover. And a double side flipbook requires two pictures. If users don't want to customize the cover, they can skip this step.

Step6: Preview the Demo

Users can preview the demo of the Memory Flipbook they custom on this page, and if they are not satisfied, they can return to make adjustments.

Step7: Order and Payment

On the Order page, users can select the desired Memory Flipbook size, paper type and cover type. After adding to the shopping cart, click the shopping cart button to enter the Payment page to pay. On the Payment page, select the address, payment method, and delivery method to make the payment.

4.4.3 Usability Test

In order to verify the usability of making Memory Flipbook on Memory Flipbook Online Application, I invited 5 subjects who are interested in Memory Flipbook to conduct usability test on my computer. The software used for the test is Adobe XD, and the materials used are the interactive design demo mentioned above. The main task of usability test is to complete the design of a single side flipbook and successfully place an order on the application demo. There are three secondary tasks: delete the uploaded video and add it again; on the preview the demo page,
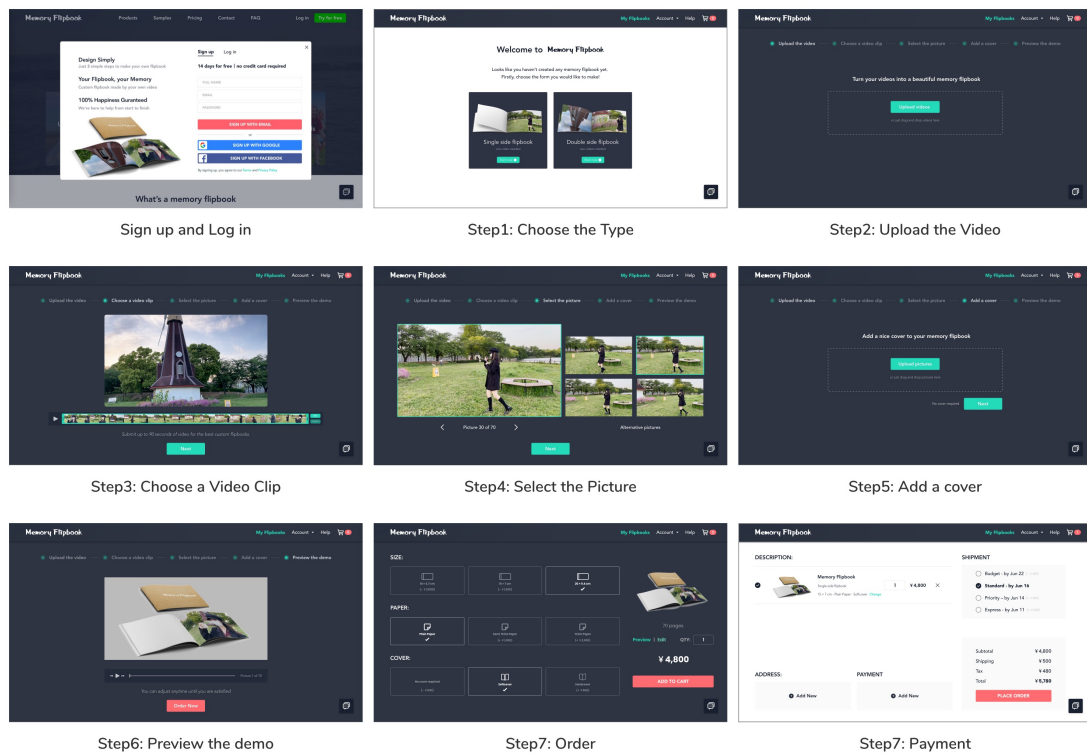
Figure 4.11 UI/UX Design

return to adjust the picture; on the order page, switch to the largest size and place an order.

I set up a SUS scale to assist objective evaluation. The SUS scale (System Usability Scale) is composed of 10 questions, including the positive explanation of odd-numbered items and the negative explanation of the even-numbered items. After the task is completed, the subject is required to score each item with a full score of 5. The questions of the scale are as follows:

1) I think that I would like to use this application frequently.

2) I found the application unnecessarily complex.

3) I thought the application was easy to use.

4) I think that I would need the support of a technical person to be able to use this application.

5) I found the various functions in this application were well integrated.

6) I thought there was too much inconsistency in this application.

7) I would imagine that most people would learn to use this application very quickly.

8) I found the application very awkward to use.

9) I felt very confident using the application.

10) I needed to learn a lot of things before I could get going with this application.

All five subjects successfully completed the main task and three secondary tasks, and all completed the SUS scale. The original scores of the SUS scale are as follows in Table 4.8:

Next, I calculate the SUS score based on the original score. The odd-numbered item's score is the original score minus 1, and the even-numbered item's score is 5 minus the original score. Since it is a 5-point scale, the score range of each item is 0-4, and the range of SUS is 0-100, so I need to add the scores of each item and multiply by 2.5 to get the final score of SUS. The revised scores and final scores of the SUS scale are as follows in Table 4.9:

Table 4.8 the Original Scores

		User1	User2	User3	User4	User5
Original Scores	Q1	4	2	3	4	2
	Q2	1	1	1	1	1
	Q3	4	5	5	5	5
	Q4	1	1	1	1	2
	Q5	4	5	5	4	3
	Q6	1	1	1	1	2
	Q7	4	3	5	5	3
	Q8	1	1	1	1	2
	Q9	3	5	5	5	3
	Q10	1	1	1	2	3

Table 4.9 the SUS Scores

		User1	User2	User3	User4	User5
SUS Scores	Q1	3	1	2	3	1
	Q2	4	4	4	4	4
	Q3	3	4	4	4	4
	Q4	4	4	4	4	3
	Q5	3	4	4	3	2
	Q6	4	4	4	4	3
	Q7	3	2	4	4	2
	Q8	4	4	4	4	3
	Q9	2	4	4	4	2
	Q10	4	4	4	3	2
	User score	**85**	**87.5**	**95**	**92.5**	**65**
	Average	**85**				

Through calculation, the SUS score of this application is 85. According to Figure4.12, it can be concluded that the usability of this application is excellent.
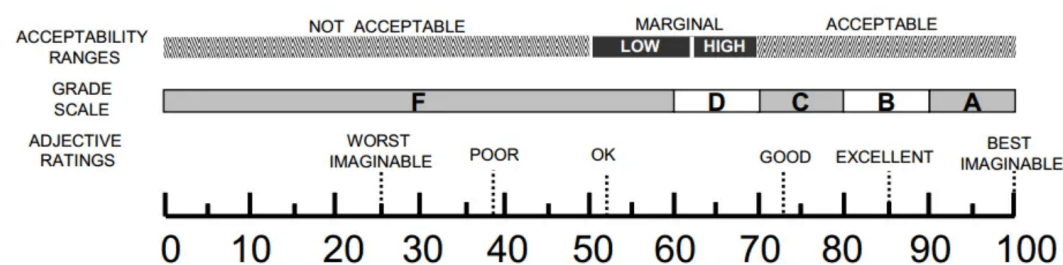
(Source: Determining what individual SUS scores mean: Adding an adjective rating scale(Bangor et al. 2009))

Figure 4.12 SUS Score

During the test, they also reflected some problems: A boy said that when selecting the picture, it is a bit complicated to select all the pictures one by one. Users only need to select pictures that are automatically filtered out. However, some girls said that she likes the mode that select and adjust all the pictures one by one. Therefore, both modes can be reserved for users to choose from.

A girl said that when selecting pictures, it is best to add a function of adding stickers and text. However, another girl said that adding stickers and text would affect the continuity of the picture. Therefore, both modes can be reserved for users to choose from.

In addition, there are some suggestions such as: When adding a cover, the user can select the picture just extracted as the cover; After switching the size or material on the order page, the display picture on the right can also change accordingly; Since nowadays people rarely use computers, we can make another mobile phone application.

The problems and suggestions they put forward are very good, and I will solve them in future work.

Chapter 5
Conclusion

This research has completed the design, testing, and iteration of the Memory Flipbook prototype four times, and completed the design and testing of its online making application demo.

The results show that Memory Flipbook is a feasible method to make memories in video format as physical objects. Also, the concept that while the girl is looking at the scenery, she also becomes the concept of the boy, is very attractive for couples. Especially women are very interested in this concept and are willing to try to make a Memory Flipbook in this way. Besides, Memory Flipbook is also a common gift for couples which allows couples to participate in the production and preparation process together. Memory Flipbook can effectively record and show memories and memory interaction for couples. The application can also conveniently provide a service that users customize their own flipbook completely freely.

5.1. Limitation

Length of video

Due to the characteristics of the flipbook, it is impossible to record too long videos in the flipbook. If the video time is too long, the thickness of the flipbook will be very thick; if the frame interval is increased, the smoothness of the animation will be affected. During the iteration of the prototype, the longest video was 90 seconds. Therefore, the current solution is to prompt the user to "Submit up to 90 seconds of video for the best custom flipbooks." in the Choose a Video Clip page of the application.

Damage and Getting Old

Memory Flipbook is also a book, and its paper will become old and soft due to the increase in time and use, and it will not always be able to maintain the original good experience. Secondly, the cover and paper of the book may be damaged due to some accidents, such as being wet by water, contaminated by oil stains, or created creases unintentionally. These cases cannot be completely avoided in life. Therefore, it is best for users to flip the Memory Flipbook with their fingers clean, and have a specific place to store them. At the same time, as for the paper selection, I could consider some more durable paper for longer use.

5.2. Future work

More Page Flipping and Bookbinding Forms

In the last round of interviews, I realized that flipbook can also try other flipping methods and binding forms. For example, users whose dominant hand is left-handed may be accustomed to flipping books with their left hand instead of their right hand. The flipbook can also be placed on the desktop, flip the pages of the book with the thumb, and make the pages fall from top to bottom. The binding position can also be set to the long side instead of the short side. The bookbinding does not have to be adhesive binding, saddle stitching, thread sewing, and loose-leaf binding can also be tried.

Application for Mobile Terminal

During the usability test of the application, one of the subjects mentioned that she and the young people around her hardly use computers now and use mobile phones most of the time. Therefore, the application for mobile terminal is also needed, which can make it more convenient for users to customize their own Memory Flipbook in unlimited scenarios.

Program and Go Live

Due to time constraints, I did not form a team to fully implement this project and put it on the iOS App Store, Google Play and other application platforms.

I only completed the design part, and I still need programmers to implement the functions in code, and further usability tests and multiple iterations until the product goes online.

References

Altın, Nur Cemelelioğlu and Hami Onur Bingöl (2018) "Place of flip book animation technique in communication design education," *Journal of Human Sciences*, Vol. 15, No. 2, pp. 943–951.

Bangor, Aaron, Philip Kortum, and James Miller (2009) "Determining what individual SUS scores mean: Adding an adjective rating scale," *Journal of usability studies*, Vol. 4, No. 3, pp. 114–123.

Bendazzi, Giannalberto (2015) *Animation: A World History: Volume I: Foundations-The Golden Age*: Routledge.

Biel, Joan-Isaac, Oya Aran, and Daniel Gatica-Perez (2011) "You are known by how you vlog: Personality impressions and nonverbal behavior in youtube," in *Proceedings of the International AAAI Conference on Web and Social Media*, Vol. 5.

Chu, Hsiao-Yun (2008) "Fuller's Laboratory Notebook," *Collections*, Vol. 4, No. 4, pp. 295–305.

Gemmell, Jim, Gordon Bell, and Roger Lueder (2006) "MyLifeBits: a personal database for everything," *Communications of the ACM*, Vol. 49, No. 1, pp. 88–95.

Gurrin, Cathal, Alan F Smeaton, and Aiden R Doherty (2014) "Lifelogging: Personal big data," *Foundations and trends in information retrieval*, Vol. 8, No. 1, pp. 1–125.

Herbert, Stephen (1989) "Animated portrait photography," *History of photography*, Vol. 13, No. 1, pp. 65–78.

Komter, Aafke and Wilma Vollebergh (1997) "Gift giving and the emotional significance of family and friends," *Journal of Marriage and the Family*, pp. 747–757.

Minowa, Yuko and Stephen J Gould (1999) "Love my gift, love me or is it love me, love my gift: A study of the cultural construction of romantic gift giving among Japanese couples," *ACR North American Advances*.

Narath, Albert and Eric I Guttmann (1966) "The Work of Film Pioneer Max Skladanowsky," *Journal of the SMPTE*, Vol. 75, No. 12, pp. 1168–1174.

Spehr, Paul C (1980) "Filmmaking at the American Mutoscope and Biograph Company 1900—1906," in *The Quarterly Journal of the Library of Congress*, Vol. 37, pp. 413–421, JSTOR.

Wade, Nicholas J (2016) "Capturing motion and depth before cinematography," *Journal of the History of the Neurosciences*, Vol. 25, No. 1, pp. 3–22.

Appendices

A. Questionnaire

Memory Flipbook Project Research

01 What's your gender? *

○ Male

○ Female

○ Others

02 What's your age? *

○ 0–18

○ 19–25

○ 26–35

○ 36–

03 What's your educational background? *

○ High school education

○ College education

○ Bachelor's degree

○ Master's degree

○ Doctoral degree

04 What is your occupation? *

○ Student

○ Government agencies, institutions

○ Enterprise Unit

○ Freelancer

○ Others _____

Figure A.1 Questionnaire: Page 1

05 What are your ways of recording your life? * 多选

☐ Record texts

☐ Take photos

☐ Record audios

☐ Shoot videos

☐ Almost never

06 How often do you record your life? *

Taking photos, taking videos, writing diaries, posting to Wechat Moments, Weibo, Instagram, and other social network software are all included in recording life.

◯ Almost never

07 Have you ever had the experience of turning memory mediums (such as texts, images, and videos) into physical objects? * 多选

☐ Yes, I keep a diary.

☐ Yes, I print the photos and make them into photo albums, souvenirs, gifts, etc.

☐ No, never.

☐ Yes, ____

08 What kind of gift would you most like to receive? *

◯ Practical

◯ Thoughtfully chosen or created by the gift giver

◯ Expensive or famous brand

◯ Novel or creative

09 Have you ever had the experience of DIY gifts? *

◯ Yes, I have done it by myself

◯ Yes, I have done it on Taobao, "Shiqi" and other Apps that can DIY gifts

◯ No, but I would like to DIY one

◯ No, and do not want to do it at all

Figure A.2 Questionnaire: Page 2

82

10 Do you know about the flipbook? *

A flipbook or flick book is a booklet with a series of images that very gradually change from one page to the next so that when the pages are viewed in quick succession, the images appear to animate by simulating motion or some other change.

○ Yes, I painted by myself

○ Yes, although not painted but very familiar

○ Yes, heard of it but not familiar with it

○ No, never heard of that

11 The goal of the Memory Flipbook project is to design a kind of flipbook that can embody videos to show personal memories and interaction with other people's memories. An application that can make this kind of flipbook online will also be designed. The application will provide two services:
Single side flipbook, users can upload a favorite video or a commemorative video on the application. The application will automatically process this video, print and make it in a flipbook, and mail the flipbook to the user.
Double side flipbook, users can upload two videos of themselves and their family, friends and lovers to the application. The application will automatically process the two videos, print and make them in a flipbook, and mail the flipbook to the user.

Would you be willing to try this Memory Flipbook making application?

*

○ Yes, I would like to make a single side flipbook

○ Yes, I would like to make a double side flipbook

○ No, will not try

Figure A.3 Questionnaire: Page 3

12 Please watch the video. A prototype of a double side flipbook is in the video.

Would you like to make or receive such a memory flipbook?

*

The Memory Flipbook project is inspired by a modern poem "As you are enjoying the scenery on a bridge, Upstairs on a tower people are watching you." I completed this prototype during a trip with my girlfriend. Flipping the book from the front side, the scenery in the eyes of my girlfriend will be viewed, which is from the first perspective. Then flipping the book from the reverse side, my girlfriend in my eyes will be viewed, which is from the third perspective.

◯ Yes, I would like make one by myself

◯ Yes, I would like to receive one

◯ No

13 If you are interested in Memory Flipbook, please choose the three indicators you care about most * 多选

☐ Animation fluency

☐ Paper texture

☐ Printing quality

☐ Size

☐ Production cycle

☐ Price and shipping

☐ Not interested

14 If you are interested in Memory Flipbook, the price range you can accept for making a book is? *

Currency unit: CNY ¥

◯ Below 50

◯ 50–100

◯ 100–200

◯ 200 or more

◯ Not interested

Figure A.4 Questionnaire: Page 4

84