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Multimedia Technology Performance and Communications

In the current technological age, computers are well-integrated into our lives. Computer technology is gradually changing our lifestyles. Multimedia is the trademark of many high-tech products, because "media" in the form of text, images, video, and audio is carried through multiple channels to create a dynamic message. Computers are often used to make interactive computer media. The message is distributed via well-designed products to the public using multimedia as a communication tool.

Tremendous technological growth has resulted from the spread of personal computers, but there have also been fundamental changes in the way we communicate. Media transmissions have changed from one-way to two-way communication. The digital information now being disseminated across the World Wide Web is creating a fresh media wave, and producing a revolution in communicating people.

There are currently three positive aspects of multimedia technology development. The first is the development of the multimedia computer hardware itself. The second is the combination of multimedia technology with interactive digital TV, intelligent household appliances, and identification technologies such as in Internet communications. This assimilates multimedia technology into education, counseling, entertainment, business management, office automation, and many other fields. The third aspect of development is the combination of multimedia with control technology resulting in more powerful industrial automation monitoring and control systems. Multimedia integrates audio, images, video, and text, to increase information content and communications potential in real time, efficient, communication systems. Multimedia integration with existing applications is becoming a mainstream development trend.

(A) Natural Interface Design

Modern communications devices require a user-friendly design. It is a fundamental consideration because user centered design focuses on understanding how people interact with machines. Interface design has become the focal point of many research programs. Incorporating artistic styling with high technology in product design permits more individuality, and a greater emphasis is placed on function. Good design is a status symbol and can fulfill a range of material and even spiritual needs. The effective communication of information to end users creates a relaxed and comfortable user environment. Designers must satisfy user requirements as far as is possible in order to create useful systems that meet the information needs of users and also their physiological and psychological needs. Designers increasingly rely on icons, windows, pop-ups, keyboard functions, and so on. These metaphors make our lives more convenient, and help in the design of new products. A variety of dialogue styles with the option to expand functionality allow everyone to access information through a common interface. We just press a button to switch between computer environments and our senses (sight, hearing, touch) are stimulated. Interaction between multiple users across a network or other complex interactions between digital products, demands that interface design and user-friendly options play a central role.

(B) Interactive User Participation

Two methods exist to convey information. In a non-interactive environment, information is sent in one direction only. The audience is passive, the communicator may use facial expressions, powerful statements and strong words, but the audience can only receive messages, not make comments, or engage in interactive participation. In interactive computer

environments, the audience can criticize, question, analyze, challenge, or even ridicule, the communicator.

Multimedia designers must recognize the rapid evolution of the computer environment. Multimedia and the Internet have helped to popularize the idea of the global village. Interactive participation makes the media experience more personal, and exposes millions of individuals to innovative cultural experiences.

(C) The Information Network

The rapid growth of the Internet in recent years has created opportunities for many new electronic communications products. The Internet can be combined with multimedia technology and open platform architecture to integrate various resources. Using a standard software interface, information can be transmitted around the world, sharing and distributing knowledge. The Internet avoids the limitations ascribed by physical location, and working hours. Information can be exchanged quickly across international boundaries. The popularity of the World Wide Web for video, text, and still images demonstrates the power of the medium. The rise of Java as a scripting language has created new opportunities. The advent of dynamic graphics, such as 3D VRML and 2D virtual worlds, in the global information network has become a new trend.

(D) Diversity in Design

Multimedia technology is the combination of various media, including text, graphics, data, video, animation, audio, and special effects. It also involves the transmission of that media through a computer system or across a network to create a visually appealing application. The development of computer technology, multimedia, and hypermedia technology has dramatically changed the techniques used in modern visual displays.

Correspondingly, the designer's ideas and ways of thinking have also changed. These days advanced technology and outstanding design combine together to make user-friendly interfaces that truly serve mankind. 2D and 3D applications broaden the display of digital media content and provide a means to further promote the development of digital design. Designers can transfer media messages through multiple channels enhancing end user understanding and providing a sense of participation and common interest.

(E) Virtual Reality

Virtual reality technology creates a new world of possibilities. Physical space extends into electronic space, and stretches far beyond the human concept of space. In virtual space everything is possible. The media can be conformed to the message and can be displayed in unconventional ways. Designers are not limited by the usual conditions, and may go into the virtual world to create, observe, or modify their creations. A wide variety of computer enhancements are available to inspire the designer's creative imagination and produce improved media presentations.

Multimedia complements the basic graphic design principles used in print media and significantly enhances the effect that can be achieved. Simply displaying printed material on a wide screen or through a projector lacks the force and engagement of an audible multimedia application with vivid lighting effects and fully interactive graphics.

Multimedia design concepts are similar to the concepts used in print media design. Both require good graphic editing capabilities and sophisticated organizational skills. But the multimedia designer needs to consider sound, dynamic effects, and interactive screen elements and this allows for a wider range of experience.

Communication is an art form in itself. It is about expressing a vision through sound, smell, or even taste. Good

communication stimulates a positive feeling in another person and multi-media communication tools can achieve this more thoroughly and completely than ever before. Technology has developed from flat, one-way communication, to two-way, interactive communication, and finally to three-dimensional, virtual worlds. This has created new opportunities for designers to learn new skills and techniques. Social progress and the rapid growth of technology have raised demands for new design concepts. The design of advanced media displays and the availability of a wide variety of tools have provided a broad development platform.

Modern design methods take into account both the message and the recipient. It is important to find a balance between personalizing the message and making it suitable for mass consumption. Communication design trends in the future will further increase the potential for effective human communication. We would like to thank you in advance for extending those possibilities.

Guest Editor **Wu-Haw Jue**

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The Art of Digital Multi-media Calligraphy

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Calligraphy is an ancient Chinese art form. It symbolizes the strong cultural legacy of the Han Chinese people, and together with painting and poetry, is considered an essential skill of the Chinese literati.

A vital tradition in the art of calligraphy is the concept of “inheritance” and the main goal of traditional calligraphy is to express and maintain cultural essence. With the arrival of the digital age, a new range of artistic skills has become available, stimulating the development of new ideas in the field.

This paper describes a method for combining the ancient art of calligraphy with modern digital technology. A practical project is described in which a traditional artwork based on the Chinese poem “A Flowering Tree” is merged with multi-media technology. In the past, calligraphy was purely a graphic art form, but using digital film editing technology, and through the use of special effects, such as animation, 3D character effects, and audio, we show how a new enhanced art form can be created. We believe this development assists in the appreciation and understanding of the ancient art of calligraphy.

Keyword: Calligraphy, Multimedia Art, New Media Art, Interdisciplinary Integration.

1. Introduction

Calligraphy is an ancient Chinese art form and a skill frequently practiced by Chinese gentleman. Chinese calligraphy, painting and poetry are the three most widespread traditional art forms. The most important concept in traditional calligraphy is “inheritance” and the main goal of traditional calligraphy is to express cultural essence.

The artist Lu Rongzhi said, “Different art forms combine to create new art forms.” Since the beginning of the digital age, there has been a rapid increase in the development of new art forms. The modern age has produced a multi-disciplinary approach to aesthetics and this has created opportunities for further inter-disciplinary integration. By combining different skill sets, new inter-disciplinary fields have been developed. Just as in industry new skills and new materials have been combined to create new products, in the art world, technology has been combined with traditional skills to create new art forms.

Calligraphy is more conservative than other art

forms and has been slow to adapt to modern innovations and technical developments. Unlike modern art forms, traditional calligraphy has not taken advantage of modern technical developments. With the arrival of the digital age, the range of artistic skills has increased and this has stimulated the development of new ideas in the field of traditional calligraphy.

The Ink-Trend Association, founded in 1976, has been at the forefront of the development of calligraphy in Taiwan. The organization has been the most progressive driver of change in calligraphy since 1981. Association members use radical avant-garde, creative techniques as well as discussions and exhibitions to challenge traditional methods. The result is a much wider skill set in comparison to the conservative traditional forms of calligraphy.¹

In the beginning, the association suffered much

¹ Quote from Lisi Xian “Frightening lonely prophet - a pioneer of Taiwan's calligraphy” Ink-Trend Association “Smell and the historical significance of art” The Conference on Modern Art Style Painting International Development” (Taipei: National Taiwan University of Arts, 2009.7), page 95 ~ 114

criticism and some doubts were expressed, but members persisted in their reforms. The development of the “New Calligraphy” was greatly influenced by their work. The members of the Ink-Trend Association combined performance, landscape, images and other elements that form the basis of traditional calligraphy, to challenge the definition of traditional calligraphy.

This is the difference between modern calligraphy and traditional calligraphy. The calligraphic style has changed in recent times. This cannot be entirely attributed to the Ink-Trend Association, but the changes have challenged the aesthetic concept of the art form. An example is found in the Calligraphy Art Foundation founded by Chuang-shi He in 2000 to continue the way of innovation in calligraphy.

Today, there are many new forms of calligraphy, but the traditional style has also been maintained. Calligraphy has followed the trend with modern times and has shown a diversity of art forms. The authors hope that by creating new forms and performance practices, it will be possible to introduce further diversity into the art of calligraphy.

In today's world of advanced technology, digital calligraphy is an experimental work in progress. Modern calligraphy is more appropriate to the modern spirit of today's world and also facilitates the imagination of modern art.

Increased competition has made it necessary to combine the calligrapher's art with modern technology. As the artist Rong-zhi Lu said "Different art forms combine to create new art forms." It is the unique nature of art in the digital age mixed with the variety of heterogeneous aesthetics and their characterization in terms of form, composition, decomposition, origin, and process that has produced the modern art of digital multi-media calligraphy. (Lu, 2001, p56-63)

Information technology also helps to distribute works of art and has become one of the tools necessary to modern artists. The use of high-tech computers has

become more widespread and software tools have become easier to use. This means that the artist's skills are no longer confined to the ink brush, but also include a wide range of digital art skills. Many artists use multi-disciplinary skills in their artworks. In other words, digital technology and artistic design have already been blended together quite successfully.

The concept of different art forms combining to create new art forms means more interdisciplinary integration and implies a multitude of skills. Several technologies are combined from various technological fields to enable inter-disciplinary integration. This trend has had a strong impact on educational, cultural, economic and social norms and seems to call for more integration between different fields.

How can we integrate the various skills from different disciplines and how can the different professions engage in inter-disciplinary dialogue? The first step is to participate in "cross-learning" through open discussion and dialog. Each profession must see the advantages of each other's expertise, and appreciate the combination of skills that produce a synergy (i.e. $1 + 1 > 2$). Sometimes there are cost benefits which can be exploited. We believe that the same purpose is served in the integration of inter-disciplinary art and this paper focuses on combining the traditional art of calligraphy with modern digital technology. In this way, we are seeking to make the art of calligraphy into a form of creative multi-media.

The original elements of traditional calligraphy are combined with features and technical elements from multi-media technology to produce new experimental art forms. The creative process is enhanced and the artist achieves a richer form of expression. Facilitating modern calligraphy in multi-media software allows for extended and more wide ranging forms of expression. Integrating calligraphy and multi-media is a reality, not a dream and the new art forms that result from this combination of skills may well produce a new generation within the

contemporary art movement of calligraphy.

2. Poetic Calligraphy

Zai-Xi (1801~1860) said, "Poetry, prose, and words, are learned through the ears; calligraphy is learned through the eyes."² Literature can be learned in an audible manner, but calligraphy requires visual understanding. While literature relies on text for comprehension, calligraphy requires artistic interpretation. Using multi-media, brings the art of calligraphy to life. In other words, multi-media can create a powerful, stimulating effect. In calligraphy, the character meanings are incidental. The beauty of calligraphy lies in pure visual imagery.³

In calligraphy, the character is the most essential form, not because of its meaning, but due to its artistic qualities. The semantic content is relevant, but the purpose is to establish meaningful forms and evoke strong emotions. Literature, on the other hand, relies on words and language to paint an imaginary picture. The author uses imagination rather than a visual representation to stimulate thoughts and feelings.⁴

In other words, both calligraphy and literature can not be separated from their textual meanings. Both express their feelings through words. Sometimes the source content of calligraphy is derived from works of literature. But the literary content is not the essence in the art of calligraphy and the main purpose is creative.

The main medium of expression in calligraphy is in the shape of the ink strokes upon the paper. Calligraphy embodies the literary meaning of the text in the rendering of the ink strokes upon the paper texture. The ink brush brings the ink strokes to life on the page and produces strong artistic emotions. The elements of a character are relatively simple lines which combine together to create

complex, elegant structures, but still retain their original simplicity.

The art of calligraphy often uses the medium of literary content. For example, the poem "A Flowering Tree" by Mu-Rong Xi is used in this project. The text is shown below⁵:

"A Flowering Tree" by Mu-rong Xi

*How will you find me
In my most beautiful moment?
For this purpose,
I am in front of Buddha
I begged for five hundred years
Asking him to let us find our fate*

*Then the Buddha turned me into a tree
Growing in the ground I am bound to
Properly prepared under the sun in full blossom
Blossoming hope all through my past life*

*When you approach
Please listen carefully
My leaves are trembling as I await tender passion
And when you pass without looking
What fell behind you
Was not my petals
But my broken heart*

This work describes the earnest expectation of love. The central character is simulated by a flowering tree expressing excitement and anticipation. But the anticipation and excitement is shattered in an instant when the awaited passion is unfulfilled.

Using flowers as symbols to express the loss of hope and inner sadness evokes feelings of the fragility of love. The central character experiences subtle changes in heartfelt emotions. It can be translated into concrete

² Thanks to Yan Chai painting see "Art Series " The first series

³ Mo Liu "calligraphy and other art" (Shenyang: Liaoning Art Publishing House, 2002.1), page 80.

⁴ Mo Liu "calligraphy and other art" (Shenyang: Liaoning Art Publishing House, 2002.1), page 80-81

⁵ Mu-Rong Xi "A Flowering Tree" Qi Li Xiang (Taipei: Eurasian Press, 2000)

words as follows: The two parts of this poem describe feelings before and after an emotional encounter. In the first part, the tree blossoms in readiness, expectation, and hope. In the second part, the hope turns to sadness, sudden disappointment and loneliness

This poem paints a poignant picture and describes a sensitive mood. The central character is strongly dedicated to love until his or her expectations finally turn to loss.

Traditional calligraphy often takes the theme of classical poetry for its content. Contemporary calligraphy uses themes from a wider range of sources than before. Sometimes modern verse is used for content and the subject matter often follows modern trends.

We also want to employ creative techniques in this project while searching for a new means of artistic expression. The artwork in this project does not consist of only one typeface but adopts a variety of typefaces as appropriate. The use of different typefaces, creates changes in mood and evokes various emotions. We sought to find a harmony between the calligraphy and the emotions.

This style of calligraphy often uses four main typefaces: clerical, mix seal, semi-cursive, and cursive. Clerical and mix seal typefaces use smooth vertical and horizontal lines so these typefaces were used to create the main structure of the project.

Semi-cursive and cursive typefaces use a gentle stroke, which is interlaced with the smooth vertical and horizontal lines to produce a sentimental mood. An analogy may be drawn between the light strokes and a series of fine ripples in a basin of water. In music, the gentle strokes might be represented by the lighter melody rising on top of a heavy base rhythm.

3. Integrating Technology with Calligraphy

Traditional calligraphy can be traced back over several thousand years. In Taiwan most calligraphers use

traditional methods; however, there is a growing movement within the field towards innovation and change. As described in the introduction, there has been an increase in the modern art of calligraphy in Taiwan due to the efforts of the Ink-Trend Association. Chuangshi He created the Calligraphy Art Foundation in 2000 to promote contemporary and experimental forms of calligraphy through exhibitions of recent innovations in the field. Compared to other arts, the rise of reform in modern calligraphy started late, but has increased rapidly. Nowadays, modern and traditional forms of calligraphy have become rivals in the field.

Hui-mei Zheng categorizes Taiwan's modern calligraphy into five main styles; painting, performance, concept, design, and a combination of styles.⁶

The authors believe that the various attempts to modernize calligraphy have resulted in broader and more expressive forms. Calligraphy has the ability to go beyond the traditional forms, and explore issues of convergence, generating new contemporary ideas that explore new realms of creativity. Therefore, we believe that it is possible to go beyond the previously mentioned five contemporary styles and produce new combinations of media by using calligraphy and technology.

Calligraphy has a long cultural legacy evolving from early writing systems. Technological change has altered the implements people use for writing. In the 20th century people used ball-point pens, but with the development of modern computer technology, even pens have been replaced by the computer keyboard, creating a new "pen-free" age. Calligraphy developed from writing, and has gradually been transformed into a professional category of fine art.

Digital technology has spread rapidly since the beginning of the 21st century and has changed the practice of many fields of industry. Calligraphy is

⁶ Reference Yi-zhong Xiong "Art of Calligraphy in Modern Taiwan," Source: Yi-zhong Xiong, The official website of Yi-zhong Xiong - Rumotan and Mo Hall Arts Network Links: http://hs.rumotan.com/modules/tad_book3/page.php?tbdsn=4

somewhat removed from daily life, because it is a specialist skill, but it will inevitably have to face up to the impact of science and technology.

Technological innovation and the rapid rate of computer developments have prompted some people to question whether the art of calligraphy could be combined with digital forms of expression. The authors believe that the creative power of digital multi-media can be utilized to help bring calligraphy forward into the new age. It remains to be seen whether art and new technology can cooperate to produce a new creative relationship.

There is a paradoxical conflict between technology and art, especially in cross-disciplinary integration. One of the main purposes of the field of multi-media is to bring together the concepts of computer technology and art. The combination of art with technology has created a new vocabulary with many new terms and phrases becoming popularized such as “Media Art”, “New Media Art”, “Techno-Arts”, “New Media Technologies”, “Digital Art”, “Electronic Art” and so on. All of these terms refer to the use of new technology to create new art forms.⁷

With this new approach to creative arts, the boundaries between art and science are bound to weaken and break. It is important to dispel the existing myth that technology is only a tool, with no capability for aesthetic expression. Artists can benefit from the application of scientific techniques. The two concepts can reinforce each other and new force can be derived, that escapes the limitations of both. Art and technology will gradually move closer together as art gradually becomes more scientific and seeks the benefits of technological performance.

4. Consciousness and the Art of

⁷ Qiu Zhiyong "Technology and art integration - the evolution of new media art" cross-Vision - Lin Pei chun - Creative Labs Digital Art Exhibition "(London: Providence University Art Center, 2009.4), page 4.

Multimedia Calligraphy

Using the example poem “A Flowering Tree” to express a variety of calligraphic forms, we hope to combine the strokes of the characters to create feelings of conflict and harmony. The different strengths of ink strokes, as well as the patterns of similar strokes create a strong visual effect for calligraphy. To the traditional art of calligraphy, this is a creative approach and an attempt to show a new way forward. In addition to the use of a variety of ink strokes, the authors also hope to advance the multimedia approach to calligraphy by enhancing the experience from a technological point of view. The following section outlines four important aspects to the development of the art of multi-media calligraphy:

4.1 Deconstructing the Completed Artwork

When calligraphy is displayed in a traditional exhibition, it is either mounted without a frame, or displayed in scroll form, or else within a frame. Works are hung in the exhibition venue for visual appreciation. We usually see a complete set of calligraphy works, forming a complete theme assembled together with the artist’s name, seal and date. Although visitors may enjoy reading the characters of the artworks line by line, the primary component of the calligrapher’s art lies in visual appreciation.

We began the process of creating multi-media calligraphy using a traditional calligraphy artwork as shown in Figure 1. The work was digitized using a scanner and stored as an image file. After that, video editing software was used for additional image processing. The original poem was deconstructed character by character according to the rhythm of the verse. Characters were deconstructed according to the weight of the strokes used and then re-colored, recombined, intertwined, and overlapped with the purpose of giving the viewer new and different perspectives from which to appreciate the art work. Reconstructions of the original are shown in Figures 2

and 3.

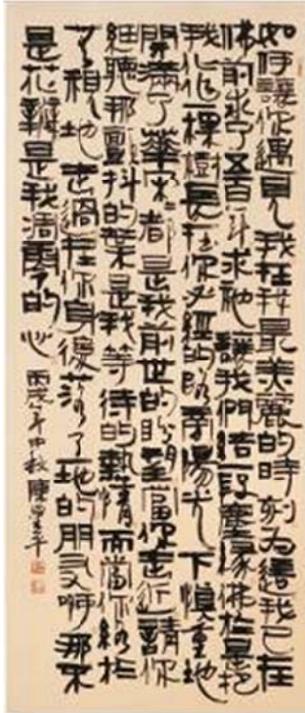


Figure 1: The complete original calligraphy



Figure 2: Reconstruction of the original with an image effect



Figure 3: Reconstruction of the original with an image effect

4.2 Three-dimensional Calligraphy

Traditional calligraphy combines brush, paper, and ink to create a basic structure, with spatial distribution, line texture and other aesthetic factors helping to build up the complete work of art. It has been called the Eastern form of abstract art.

The next stage in the multi-media calligraphy process was to convert the two-dimensional images into three-dimensional graphics. We used video editing

technology to alter the characteristics of the original plane, viewing different parts of the work in overlapping images and changing transparency. Parts of the work were zoomed or panned to provide a visual effect. The original two-dimensional work becomes three-dimensional and gains a new life through the application of science and technology. Examples of three-dimensional transformations are shown in Figures 4 through 6 below.



Figure 4: A close-up of the original calligraphy



Figure 5: The effect of three-dimensional overlay



Figure 6: The effect of three-dimensional image transparency

4.3 Adding Music to Create Atmosphere

Appreciation of calligraphy traditionally involves silent contemplation. On the one hand this can lead viewers to view the content in a manner which resonates with their own hearts. On the other hand, multi-media calligraphy can also enhance the pure essence of the art by providing music which evokes feelings, and help create structure and so on.

Through video editing, and the combination of images with ink strokes and music, the viewer can be drawn into new channels and different realms of appreciation. Music has a powerful influence, and combines well with works of calligraphy and poetry to create an emotional atmosphere.

4.4 Enhancing the Artwork with Special Lighting Effects

Traditional calligraphy artworks are painted on rice paper and are two-dimensional. When the artwork is

completed, it is mounted and hung on a wall. A person may view the work at different times of day, in natural light, or in a professional exhibition hall. Exhibition halls use space and angled light projectors to produce special effects.

In any event, whether natural or professional lighting projectors are used, the effect is to separate art works from each other and provide visual focus. In multi-media calligraphy, special effects can be added to video clips to achieve the desired visual effects. These effects can be combined together to create unique visual experiences. For example, the effect of different colors can be used to create a sense of space or reinforce the visual experience or create a dynamic atmosphere. The multi-media visual interface can create new visual perspectives for the appreciation of calligraphy. Examples of various lighting effects are shown in Figures 7 through 10 below:



Figure 7:
The original
calligraphy



Figure 8: The effect of
different colors of light



Figure 9: The effect of different colors of
light



Figure 10: The effect of
different colors of light

5. Conclusion

In conclusion, an original calligraphy work entitled "A Flowering Tree" was converted to a multi-media art work through a process of deconstruction, and the addition of three-dimensional characteristics. Audio and special lighting effects were also added to intensify the viewing experience. Thus, through the combination of multi-media technology a new technological form of calligraphy was created. It is hoped that this project will serve as a creative vision for a wider interpretation of digital art forms.

The advances made by new technology have provided many everyday conveniences. Increased communication has brought people closer together and closed the distance between technology and art. Thanks to technology, the boundaries between art and science are no longer so clearly defined. Through closer integration with the arts, technology has even helped us communicate with each other.

Interdisciplinary integration is a fairly new development, and it is still open to future trends. One thing is for certain, artistic integration can bring out the creationist spark in everyone. We have based this work on the spirit expressed in the poem, "A Flowering Tree". The real process of multi-media calligraphy is to find the fusion point between technology and art. We believe that such an experiment in creativity is a merely a starting point in this process, and not a final destination!

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The Aesthetic Color Scheme of Accessible Web

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In order to create a fair and justice Internet environment, web accessibility is entering its 8th year since setting action. Although the reinforcement of governmental promotion towards fair and just Internet environment makes a potential future, aesthetic problem remains to be solved, especially on color profiling. This research will focus on the color profile of web accessibility. At the documentation trace back stage, color profile includes principles of function and aesthetics. Content analysis was used during analysis stage. Research result had shown five aesthetic principles with accord to its level of influence as follows: accent, dominant, balance, contrast and gradation. These five aesthetic principles were officially named “Color scheme rating method for web accessibility”. Results from experimentations during experimental stage had shown “Color scheme rating method for web accessibility” could indeed enhance web page aesthetics.

Keywords: web accessibility, color profile, principles of aesthetics, principles of function.

1. Introduction

Web accessibility resolves the problem for handicapped people to receive online information, but there are still a lot of unseen details, especially the function and beauty often cannot simultaneously satisfy both pages. “Introduction aesthetic” depends on the Web page color configuration while Web accessibility must take account of the good principles. So the study for barrier-free Web color configuration allows the writer to do a series of discussion.

1.1 Background and Motivation

In today's domestic production of Web accessibility, pursuant to the Executive Yuan of R.O.C., formulation of 14 specifications usually focuses on handicapped ability to “understand” and often neglects the part of “introduction aesthetic”. Many people mistakenly believe that Web accessibility is to disadvantaged groups and settings, in fact, the W3C Web Accessibility aims for “All User” can comfortably view the Web site, search data, receive message, etc. This study to accessibility makes color configuration as its main subject. The result of color vision deficiency in the world is up to 8% (Li, 2007, pp. 956-957). When a web designer creates a

website and does not consider color configuration, it will cause the reader to experience difficulty while viewing the website. Many designers express the difficulties of sacrificing design to satisfy the objective of sending correct message to handicapped readers. (Chang, 2008).

1.2 Objective

This study is intended for Web accessibility for color configuration of trying to be color aesthetics of theory, practical application in Web accessibility. Its main objectives are divided to three: (1) summary of principles and color configuration; (2) the accessibility aesthetic and functional; (3) to achieve fair network and informative communication for color vision deficiency.

2. Literature Review

2.1 Web Accessibility

Tim (2007), has issued a statement in 2007. He thinks the Internet is the basis of three things: (1) Universal linking; (2) Open Foundation for Information-driven Innovation; (3) the Separation of Layers, the three principles applicable to all Web sites.

ROC, Taiwan as of December 5, 2008, a total of 4,948 barrier-free access to the site through detection and

recognition, which marks A+ grade 2,949. W3C does not include A+ under its grading, therefore for Taiwan Government to encourage the development of accessible Web pages, in between A and AA the system established A+ rating.

2.2 Color Aesthetics

Color configuration mode of Web

General speaking, the higher color aesthetics can cast better resistance. (Lin, 1991, pp.147-174) Color configuration consists of different strategies, but majority follows the extension of the three attributes of color, or generally, by tone or solid colors.

The beauty of color configuration

The solutions of color configuration beauty include “Balance”, “Accent”, “Contrast”, “Gradation” and “Dominant” 5 axes.

“Balance”, also known as equilibrium refers to the Visual balance, and not on the actual weight of each element. Color balance is based on hue, lightness and Chroma two-phase comparison of collocation, without losing the unity of the whole phenomenon of color. (Lin, 2002, pp.98-119)

“Accent” is also known as Focus. In ordinary non-singular images, plus a small area and ambient color difference of color, which immediately became the focus of the picture, the human eye will take the initiative to focus on this area of distribution, visible, which is the so-called “introduction focus color”.

“Contrast” refers to the color and placement together, producing significant opposition. The forms can be divided into hue contrast, luminosity contrast, color contrast, complementary contrast, cold and warm contrast and size contrast, luminosity contrast ratio of feeling and his comparison are strong. (Lin, 1998, pp. 61-68)

“Gradation” is also known as the gradually layer, “introduction gradually changing” of meaning. Color and color between with a certain order or proportion and gradually increase or decrease their rules in accordance

with a certain degree of order in a certain direction change. (太田昭雄 & 河原英介, 2002, pp. 122-127)

“Dominant” also known as the primary transfer or disposal, refers to two or more colors at the same time, in order to make sense to produce a unified picture, so the average of all colors, plus a layer of the same color, this layer common color that is referred to as the dominant color.

2.3 Color Configuration of Web Design

The Basic Principles of Web Layout

Monitor: Web design is intended to convey the message that your computer monitor is conveyed by one of the most important media. Its color is light trichromatic theory (RGB) color mixing, producing electronic beam hitting on the monitor, the user can see on the monitor in a different color.

216 Web-safe colors: the so-called 216 web safe-color refers to whether or not the hardware, software, equipment, and in most cases, the normal color, and the rendering of the results is very close to the design of the Web page designer, use the web-safe color distortion can be avoided.

The function of color configure on web pages

Color itself has a function, through color configuration there will be two or more of the color, and the functional specification will appear. The attractive is the affection element in color, known as “tracking” and “attention”. The color has higher attractive, not only because of the color brightness, but the position in color figure makes some specific focus. (Lai, 1987, pp 80-89)

Color has identification, which makes everything look different with others. On the other hand, color can make things be identified and readable (shown in Table 1).

Table 1. The definitions of Legibility and Readability

Functions	Definitions
-----------	-------------

Identifiability	Legibility is the basis of different colors, resulting in images or charts can be clearly visible.
Readability	Readability refers to the different according to the color ,the text is easier to read.

Source: 坂本邦夫 (2007, pp. 20-24)

2.4 Color Vision Deficiency

Color Vision Deficiency commonly known as the “color blind” or “color amblyopia” refers to the eyes and the ordinary course of different colors, 100% effective treatments. The species can be divided into full-color

blindness, color blindness, blue, yellow, color blindness, with red green blind ratio up, check the way off with color map, color detection method, D-15, color blindness by three kinds of inspection mirror. (Wang, 2004, pp. 248-255)

2.5 Summary

According to the literature review, the barrier-free Web color configuration key into two parts, namely the functional principle (shown in Table 2) and aesthetic principles (shown in Table 3).

Table 2. Functional Principles

Functional Principles	Definitions
Attractive	The degree of color to attract users that is the color of the focus.
Visual Written	Image is clearly visible, color is applied to the distortion, the tone is appropriate.
Read ability	Whether the text is readable, text and background color.
Ability	Whether to use the 216 Web-safe colors, and whether the site properties.

Table 3. Aesthetic Principles

Aesthetic Principles	Definitions
Balance	Visual balance and not practical weight, is the only quality equal relations.
Accent	A color and ambient color difference and become the focus of the screen.
Contrast	Two or more colors and reset to reflect significant opposition.
Gradation	Color and color, with a certain order or proportion and gradually increase or decrease.
Dominant	Two or more of the colors and placement, all colors are a dominant color.

3. Research Methods

This study is divided into three phases. The first phase is using introduction literature method, searching the summarized data, categories, principles, and aesthetic function. The conclusion presented in sections 2.5; the second stage of the analysis phase, use introduction content analysis, for Web accessibility analysis of the

aesthetic principles. The third stage of the analysis stage uses experiments.

3.1 Content Analysis

From a user perspective, to invite you to have a talent for art-related background, for the Executive Cabinet of “introduction quality enterprises and civil society care website” color configuration of aesthetic and aesthetic

evaluation criteria are based on the literature review conclusions of five aesthetic principles.

Passion

Using Purposive sampling methods, selection of Web accessibility has representative Websites in order to enhance the credibility of this study. This study samples from the Executive Cabinet in 95, 96, 97 organized “introduction quality enterprises and civil society care website” activities of award-winning website, culling has failed to come online in five sites, a total of 53 total samples. Since the elections website must have previously adopted Web accessibility A+ grade, so that the winning site has the function of the principle in this discussion.

Coders

This study has chosen two art background of professionals, according to their own design experience or years of research on aesthetic form, do one of the sample analyzed, summarized the proportion of beauty,

its principles as follows (shown in Table 4).

Table4. Coders

Number	Career	Position	Experience
D01	Design Company	Designer	11 years
D02	Graduate School	Graduate Students	10 years

Research tools

According to the literature review, data analysis, and accessibility color Visual aesthetic development configured out of the five main categories, fifteen times category (Table 5), encoding the content analysis of each classification exists in the Web site, by the time the classification in zero to more than one classification, statistical results can only be assigned, the number of mining was informed that the classification in Web accessibility in the degree of color configuration.

Table 5. Classification and definition description table

Main Categories	Sub Categories	Description
Balance	Rationality	Each block of color or colors on the screen there is the necessity of the existence
	Coordination	Among the various colors all help each other on a Web page, there is no clear master-slave relationship between them.
	Stability	Each block of color balancing on a Web page and the area is assigned an average, between the color tone is also very similar.
Accent	Introductory	To color a variety of content classification; and is able to quickly find a appropriate link button.
	Distinction	Hierarchical information using the color or colors to clearly differentiate, and to hit points before and after the link button will change the color.
	Attention	Color on a Web page that the user has attracted, and have the information of the focus cues.
Contrast	Color Contrast	Evaluated in two colors on the color wheel between the angle of 120 ° ~180 °.
	Conflict	On the page layout area of the station by various tones or tonal

		variation, and master-slave relationship between apparent.
	Sense of contradiction	Page layout with color perception caused by far the overall picture is not coordinated or tension.
Gradation	Layered	Web page layout and the rich diversity on the Visual color changes.
	Continuity	Continuity of hue and tone on the Web page layout.
	Regularity	Two color transitions between certain rules.
Dominant	Consistency	Web application in the Visual sense of color is not cluttered with integral.
	The overall look	Pages of Visual appliances on the theme of tones.
	The Major Tone	Web Visual colors join the same color tone.

The Scope of the Study

The study only for domestic accessibility of color configuration do color aesthetics of assessment, but in the course of the study, may have other factors influencing the results of the study. Based on the study of objectivity to consider in research areas defines the following descriptions:

1. The study for domestic accessibility color configuration do the assessment of the functional and appealing, such as a Web page font size, Flash animations, applications, pictures, audios, sound effects, etc., are not included here.
2. This research has made only for domestic government recognition and award of Web accessibility.

Reliability Testing

This study used Holsti's (1969) "Introduction Interactive Score Reliability Method" formula, the formula is as follows:

$$\text{Mutual consent degree} = 2M/N1 + N2$$

M is the number of totally agreement; N1 as first coders should agree with number; N2 is the second largest coders should agree with number.

$$\text{Reliability} = n * (\text{average mutual consent degree}) / 1 + s$$

$$(n-1) * \text{average mutual consent} \circ s$$

n is involved in coding staff

This study based on the above formula calculation,

the two-digit code' mutual consent degree 0.83, and 0.91 reliability. According to the cultural pointer set Gerbner established 0.80 reliability value criteria for the study of the reliability of 0.91, so has the reliability (Wang, 1991).

Experiments

The analysis phase of the objects in the selection of a representative of the site, become a control group of tools. The selected "introduction of Taipei City heart life Association" site consists of two color vision deficiency to use after the modification of the direction, and then pursuant to the analysis phase are put together for accessibility of "introduction color weighting method", plus expert advice, the experimental group of experimental tool design.

Variables

Experiment is divided into early experiments and formal experimentation, the purpose of the early experiments in order to reduce formal experiments of error or influencing factors, it is for the study of experimental design for test-related variables, the relationship between the variables are described below, and visually rendered (Figure 1).

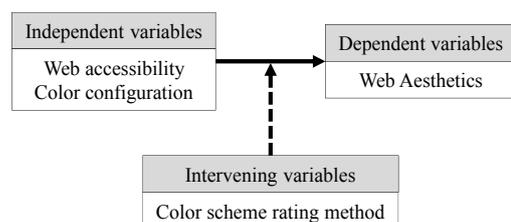


Figure 1. The variables of the experiment

Independent variables: This study from variables for barrier-free Web site color configuration, divided into “introduction correction before the Web site and the amended website”.

Dependent variables: To users of the site is mainly an aesthetic perception of color, the respondents were satisfied with the level of the Web site color.

Intervening variables: In these intermediate variables as color configurations, meaning whether or not to use the Institute proposed “introduction color weighting method”.

Control variables: This experimental system of two sets of experimental sites, in addition to the form design color in different ways, other text content and fabrication platform, interactive mode, etc. are consistent, so for this experiment of control variables.

Sampling

The purpose of this study respondents were divided into two categories, namely “Introduction of Art and Design background related learning group” and “Non-Graphic Design background related learning group” to “Introduction Quota Sampling”, also known as one fixed character sampling, quota sampling, way to get in the two classes of 30 students, for a total of 60, the two groups separately to repeat the experiment by way of a questionnaire after the experiment.

Data collection

Experimental data collection to obtain questionnaires, scoring five-point of “Likert Scale” standard reference, so that the respondents' scales to answer the questionnaire topic, be specific and pointed out that his statement on the meaning of the question of identity. Scale design according to varying degrees, from the most positive to the negative can be divided into five levels.

Analysis methods and tools

The study produced average T of “Introduction Paired Sample T Test”, data analysis methods combined with the study of experimental methods and the use of statistical software questionnaire, SPSS 12 as statistical analysis tools. Analysis methods will be divided into “introduction of art and design background related learning group” and “non-graphic design background related learning group” two classes, two types of respondents were between each other.

4. Data Analysis and Discussion

To view internal accessibility of color appearance, this study is configured for a Web page color configuration effects of itemized and time of consolidation and analysis, and summarize the results of the analysis.

4.1 esthetic principles to color configuration of specific gravity

According to the color configure categories, indexing 53 samples of accessible websites, the value of configure and percentage is shown following, Table 6.

Table 6. The figure of simples in main categories

Categories	Number	Percentage (%)	Order
Balance	230	17.7	3
Accent	374	28.9	1
Contrast	221	17.1	4
Gradation	168	13.0	5
Dominant	303	23.0	2
Total	1296	99.7	

From Table 6 the impact Web accessibility principles of color configuration of beauty, according to

the proportion of the sort, in order to focus on upper atmosphere 28.9%, 23.0%, balanced 17.7%, vs. 17.1%,

gradually layer 13.0%. Distribution from a number of times or seeing, focused in the barrier-free Web color configuration greatest influence, maximum utilization;

minimal impact asymptotically layer, the lowest usage. The Interaction of the five main categories is shown on Figure 2.

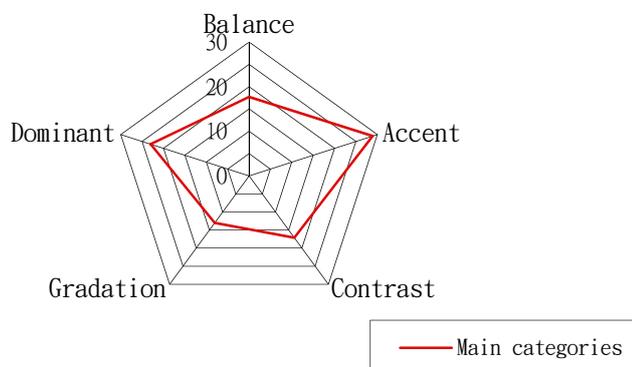


Figure 2. The radar chart of main categories proportion

Table 7. Configure of Sub-Categories

Sub Categories	Sum of the number of samples	Percentage of the total number (%)	Percentage order
Rationality	80	6.2	9
Coordination	77	5.9	10
Stability	73	5.6	11
Introductory	131	10.1	1
Distinction	118	9.1	4
Attention	125	9.6	2
Color Contras	82	6.3	8
Conflict	118	9.1	4
Sense of contradiction	21	1.6	15
Layered	70	5.4	12
Continuity	47	3.6	14
Regularity	51	3.9	13
Consistency	120	9.3	3
The overall look	93	7.2	6
The Major Tone	90	6.9	7
Total	1296	99.8	

The proportion of a Webpage color configuration in Sub-categories.

The value figure based on sample of color profile of beauty is shown on Table7.

Learned from the previous table, in order to

introduce the time in the weight class, “high-resistance”, “unified feeling”, “conflicting” and “segment of”, “wholeness”, “dominating color”, “color contrast”, “reasonableness”, “harmony”, “stability”, “layered”, “regularity”, “continuity” and “contradictory sense”.

4.2 Aesthetic principles of analysis and discussion

This research will present Web accessibility has achieved various identities of the website content analysis method of doing color configuration. The results of the analysis the frequency distribution statistics, mining in order to focus and unity, balance, contrast, gradually layer. In this proportion will be its results known as “introduction color weighting method”, available to subsequent in barrier-free Web design, color configuration of consideration.

Focus: According to the results to be inferred, at present the network of Web accessibility, the first heavy elements introduction introductory; secondly to “introduction of attention”, accessibility of color configuration, and is an indispensable ingredient.

Consistency: According to the results of the inference of, accessibility of color profiles, with thematic color often has the dominant color in itself, but to dominate the color screen is easy to make people feel a sense of the whole.

Equilibrium: At present, the accessibility of color configuration, its importance in “introduction focus”, so it is not color configuration included in the priority principle.

Contest: “Introduction Contrast” in introduction contradictions are barrier-free Web color configuration is not important, in the content analysis of the validity period, the experts have also made the same idea. “Cold contrast color” in most people is important, but once you consider the factors listed in color vision deficiencies, there are a few groups of color is not used, for example, red and green, yellow and blue.

Ramping: At the present, the accessibility of the color

profile for color “introduction color application rich with diversity”, “hue of continuous or continuous-tone”, “between the two color with certain rules gradually convert”, is not included in the color profile of the factors to be considered.

4.3 The analysis and discussion of T test result

The tool paired sampling T test, in average values T test is the major path in this study. To approve the appearances of the experimental group that websites are better than with functional control group website, we use analysis phase out “introduction color weighting method” actually used barrier-free Web color configuration. Analysis of the respondents were divided into “introduction of art and design background related learning group” and “non-graphic design background related learning group” two kinds, those two categories of respondents are not comparable between the individual calibrating both sites significant differences exist between.

Average Values

The result of Non-graphic design background related learning group

Table 8 shows following result: In this group, respondents are generally considered that the appearances of the experimental group websites are better than with functional control group website.

The result of Background in art and design related learning group

Table 9 shows following result: In this group, respondents are generally considered that the appearances of the experimental group websites are better than with functional control group website.

Table8. The result of T test in Non-graphic design background related learning group

		Average number	Unit	The standard deviation	The standard deviation of Average number
PAIR 1	UN-fixed	2.97	300	.941	.054
	Fixed	3.13	300	.830	.048

Table 9. The result of T test in Background in art and design related learning group

PAIR 1	UN-fixed	Average	Unit	The standard deviation	The standard deviation of Average number
		number			
		2.70	300	1.234	.071
	Fixed	2.96	300	1.118	.065

Paired Samples T test result

A paired T test samples mainly observation the significant value between the control group website and experimental group website.

The result of Non-graphic design background related

learning group

Based on Table 10, the significant value between two groups is 0.017. Because of the minimized on the passion units, the studying defined the standard value “p” (p<0.05). To makes the result reasonable.

Table 10. The result of Paired T test in Non-graphic design background related learning group

PAIR 1	Un-fixed - fixed	The variables of PAIR					t	Allowed level	Distinctiveness
		Average number	The standard deviation	The standard deviation of Average number	95% Confidence interval	MIN			
		-0.160	1.151	0.066	-0.291	-0.029	-2.407	299	.017

*p<.05

The result of Background in art and design related learning group

Based on Table 11, the significant value between two

groups is 0.010, that achieves the standard p<0.05, and the p=0.01 that obviously higher than the value of Non-graphic design background related learning group.

Table 11. The result of Background in art and design related learning group

PAIR 1	Un-fixed - fixed	The variables of PAIR					t	Allowed level	Distinctiveness
		Average number	The standard deviation	The standard deviation of Average number	95% Confidence interval	MIN			
		-0.260	1.740	0.100	-0.458	-0.062	-2.587	299	.010

*p<.05 ; p=.01

Analysis of experimental results and discussion

Based on the result of T test, we define that in

“Non-graphic design background related learning group”, respondents are generally considered that the appearances of the experimental group websites are better than with functional control group website. Because the distinctiveness value is 0.017 ($p < 0.05$), that makes us check the results. In “Background in art and design related learning group”, respondents are generally considered that the appearances of the experimental group websites are better than with functional control group website. Because the distinctiveness value is not only 0.010 but less than 0.05, the significant standard, that makes us check the results.

5. Conclusion

This study aimed to discuss accessibility color configuration, while the sample is awarded winning under Web accessibility, the research may extend to other pages and provide the Web designer directions to set up color configuration. For Web accessibility design, in addition to the correct delivery information, there are visual satisfaction, and from past introduction “easy to use but does not look good stereotype”.

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Discussion and Application of Taiwan Folklore Artistic Performance-Song Jiang Masks of General Troupes

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Folk arts are dynamic cultural assets conveying messages of people's life styles as well as recording their daily activities. With the passing of times, they murmur the stories of common people's lives with cultural connotation. Undeniably, folk arts are precious treasures for a nation. Therefore, we'll dig out the treasures and promote them. On the other hand, with the mission of exalting folk culture, folk art groups should function as conservatories to preserve the local culture. Actually, for the purpose of showing the value of its survival in the history, an outstanding folk art group would retrospect and inspect itself continuously, improving the quality at every stage as it grows up with times. The authorities and people are expected to give their hands to such excellent folk art groups and encourage them to run persistently.

Keyword: The Song Jiang Battle Array, Masks, Digital Archives, E-LEARNING.

1. Introduction

Song Jiang Battle Array is the most important traditional activities of religion in Neimen. Song Jiang Battle Array was developed as a form of local self-defense against raiding bandits. Today, it combines martial arts and religious ceremony into a type of folk performance that enlivens temple festivals all over Taiwan.

Application is different from the books simply in words and pictures to convey information, using the recent popular Iphone touch phone functions, making e-books, etc. Face the Sung Chiang Battle Array unique culture popularization of digital archives. Interview with historical data to collate and to Epub (Electronic Publication) format e-books publishing the information presented in a dynamic way. Way of using multimedia touch to give the public a wide range of information, enhance the mood of Song Jiang and carry forward the traditional culture culture is a unique mask the purpose of our study.

2. Literatures

2.1 Song Jiang of history

The authorities and people are expected to give their hands to such excellent folk art groups and encourage them to run persistently.

For ages, how to preserve, convey and exalt the folk arts through cultural policy making and executing are great challenge for the authorities. In recent years, in response to the sense of "glocalization", the authorities manage to unite the features of local industries with the international or district festival celebration activities held in very place to evoke the community awareness, develop sightseeing industry, promote the economic prosperity, build up good reputation as well as increase the opportunities for international cultural exchange. Among the folk arts in Taiwan, the performance of "Sung-Chiang Martial Art" is highly praised. Converging special features of physical education, military art, religion and art, "Sung-Chiang Martial Art" catches all the audience's eyes and becomes the spotlight on the stage. In recent years, the launching of Sung-Chiang Martial Art Clubs among schools at all levels has brought

forth the development of this folk art.

Speaking of “Sung-Chiang Martial Art”, it originated from the Mainland China. Unfortunately, during the “Cultural Revolution” period, the weapons used by “Sung-Chiang Martial Art” had been banned and the groups were forced to dismiss. From then on, Taiwan has become the only place where the whole “Sung-Chiang Martial Art” skills were preserved intact.

Interviews within the door and found the original face of local playing difficult to get, so through research Township, Tainan County incur to obtain the original image file orang-Clan, and the element characteristics of the analysis found the proportion of re-drawn artwork, the follow-up of the Face material drawn.

Figure 1 is presented by the finished artwork information.

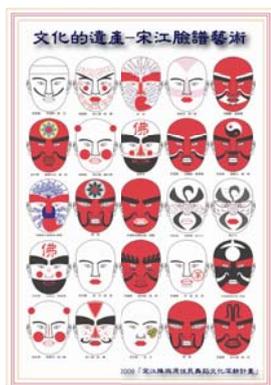


Figure 1. Song Jiang Mask

2.2 Tangible Media

Physical media by Ullmer and Ishii (2001) proposed is a workable medium for the presentation in real (manipulative physical representation), using the physical media as the man-machine interface as a control (physical control) of the important properties of (Figure 2).

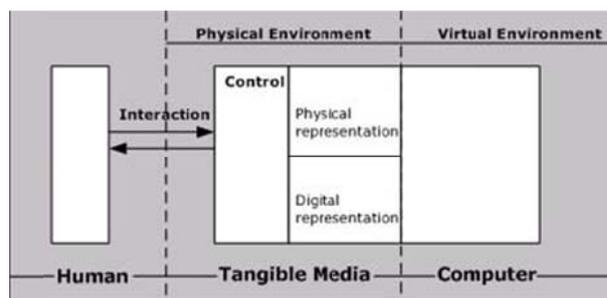


Figure 2. Physical media interaction model

2.3 EPub

EPUB (short for **electronic publication**; alternatively capitalized as **ePub**, **EPub**, or **epub**, with "EPUB" preferred by the vendor) is a free and open e-book standard by the International Digital Publishing Forum (IDPF). Files have the extension .epub. EPUB is designed for reflowable content, meaning that the text display can be optimized for the particular display device. The format is meant to function as a single format that publishers and conversion houses can use in-house, as well as for distribution and sale. It supersedes the Open eBook standard.

EPUB consists of three specifications:

- **Open Publication Structure** (OPS) 2.0, contains the formatting of its content.
- **Open Packaging Format** (OPF) 2.0, describes the structure of the .epub file in XML.
- **OEBPS Container Format** (OCF) 1.0, collects all files as a ZIP archive.

Basically, EPUB internally uses XHTML or DTBook (an XML standard provided by the DAISY Consortium) to represent the text and structure of the content document, and a subset of CSS to provide layout and formatting. XML is used to create the document manifest, table of contents, and EPUB metadata. Finally, the files are bundled in a zip file as a packaging format.

Table 1. Reading Systems and Software

Software	Platform	DRM formats supported	Notes
Adobe Digital Editions	Windows, Mac OS X	Adobe Content Server	
Aldiko	Android		
FBReaderJ	Android		Open source
BookGlutton	Web		Free, online ePub reader with a focus on the social aspects of reading.
Bookworm	Web		Free, open source, online ePub reader.
Calibre	Windows, Mac OS X, Linux		More often used for library management, conversion, and transferring to devices than reading.
EPUBReader	Firefox add-on Windows, Mac OS X, Linux		Free Firefox add-on, with which you can read ePub-files in Firefox.
FBReader	Windows, Linux, PDAs		Incomplete ePub support.
Freda	Windows Mobile		Only works with DRM-Free ePub files.
iBooks	Apple iPad	FairPlay	
i2Reader	Apple iPhone		
Lexcycle Stanza	Windows, Mac OS X, iPhone		
Lucidor (software)	Windows, Mac OS X, Linux		
Mobipocket	Windows, BlackBerry, Symbian, Windows Mobile		
Okular	Linux, Windows, Maemo, Mac OS X		
Openberg Lector	Firefox add-on		
Talking Clipboard	Windows		Text-to-speech software, that can read ebooks.
WordPlayer	Android		

Table 2. Editing systems

Software	Platform	Notes
Adobe InDesign	Windows, Mac OS X	

Atlantis Word Processor	Windows	Converts any document to EPUB; supports multilevel TOCs, font embedding, and batch conversion
BookGlutton Converter	Web	Conversion tool
eBooksWriter	Windows	Also can produce MobiPocket files
eCub	Windows, Mac OS X, Linux	No-encrypted only, also can produce mobi
Feedbooks	Web	Free cloud service for downloading public domain works and for self-publishing
iStudio Publisher	Mac OS X	Desktop publishing and page layout application
Sigil	Windows, Linux, Mac OS X	Free, Open source under GPLv3. Go to Sigil at Google Project page.
Smashwords	Web	Ebook publishing and distribution platform for authors and publishers. Authors upload manuscript as Word .doc or .RTF, formatted to Smashwords Style Guide, and Meatgrinder conversion system converts file into multiple ebook formats such as EPUB, PDF, MOBI and HTML

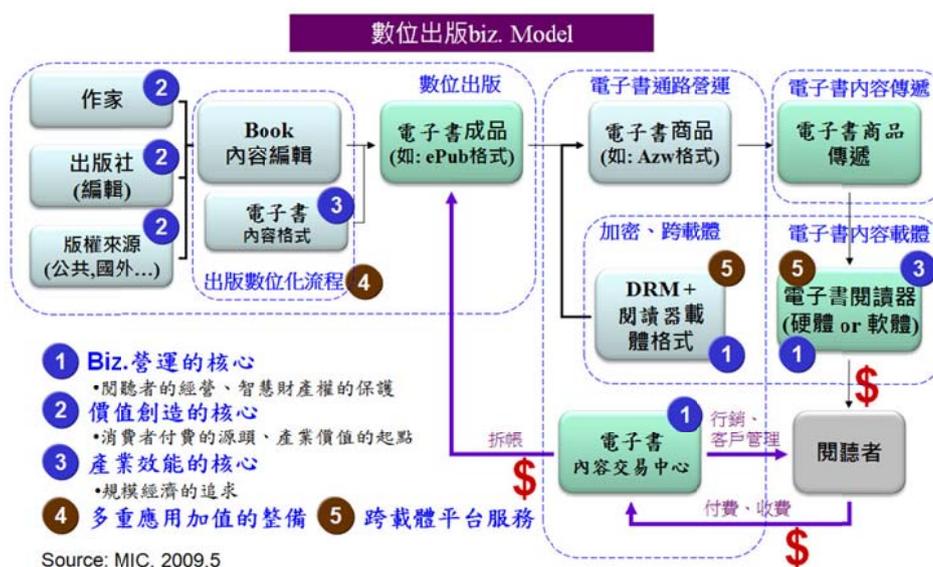


Figure 3. Digital publishing model

Source: Ministry of Economic Affairs 98 years of digital publishing industry development strategies and action plans

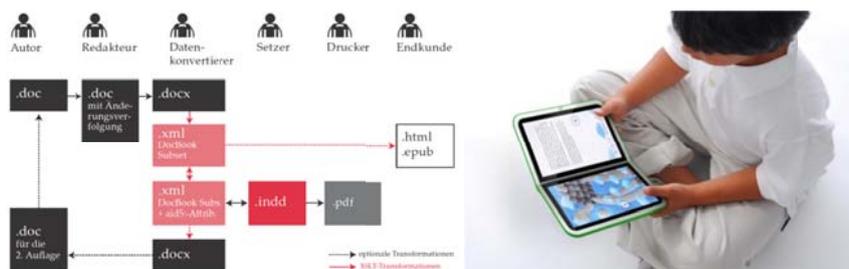


Figure 4. e-book application mode

3. Works of architecture design

3.1 Technology

A touchscreen is an electronic visual output that can detect the presence and location of a touch within the display area. The term generally refers to touch or contact to the display of the device by a finger or hand. Touchscreens can also sense other passive objects, such as a pen. However, if the object sensed is active, as with a light pen, the term touchscreen is generally not applicable. The ability to interact physically with what is shown on a display (a form of "direct manipulation") typically indicates the presence of a touchscreen.

The touchscreen has two main attributes. First, it enables one to interact with what is displayed directly on the the hand, where it is displayed, rather than indirect with a mouse or touchpad. Secondly, it lets one do so without requiring any intermediate device, again, such as a stylus that needs to be held in the hand. Such displays can be attached to computers or, as terminals, to networks. They also play a prominent role in the design of digital appliances such as the personal digital assistant (PDA), satellite navigation devices, mobile phones, and video games.

3.2 Touch Screen Technology

A touch screen is a display device which combines an input and output device. It can detect touch position within the display area. The issue usually refers to touch and contact to the display of the input device by single touch or multiple touches [21,25]. Although a touch screen can sense objects such as a touch pen, it is not feasible in reality. The ability of interaction with a display represents its feasibility of a touch screen.

3.2.1 Resistive Touch Screen

A resistive touch screen panel is composed of several layers as shown in Figure 5. These layers are indium tin oxide (ITO) electrical layers, spaces, and an ITO glass. When a finger or an object touches on the touch screen, the two ITO layers will connect at that point. The touch

screen then behaves under a pair of voltage dividers which are connected to outputs. This changes the electrical current and becomes a touch event to be sent to the controller for processing.

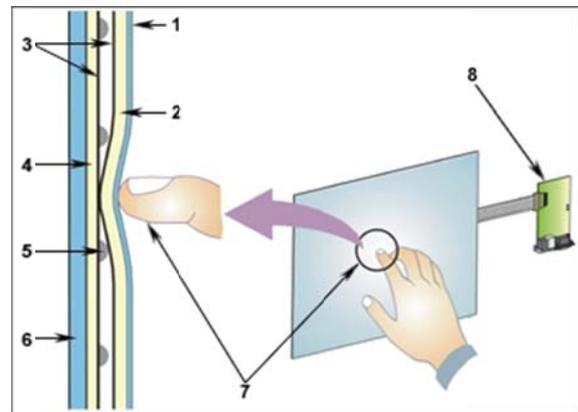


Figure 5. The resistive touch screen

3.2.2 Capacitive Touch Screen

The capacitive touch screen is made of glass with two transparent conductive layers such as ITO as shown in Figure 6. The surface is coated with SiO_2 . This type of touching sensor is a capacitor in which the plates are the overlapping areas of the touch screen. Since the human skin also conducts micro-electricity, a touch on the touch screen of the sensor will make the electric field and create a measurable change. These sensors work on proximity of the conductive medium such as a finger. It is a better clarity than resistive touch screen. But it only responds to finger touch and will not work with a pen or other nonconductive object.

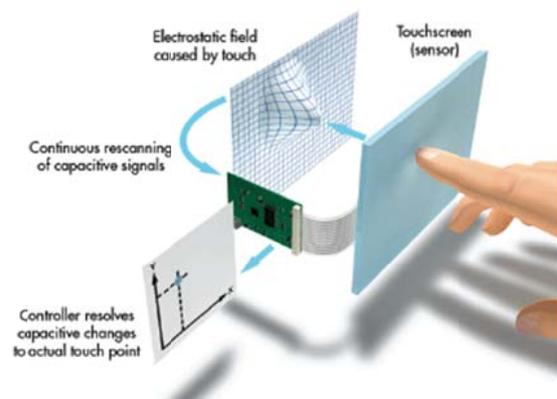


Figure 6. The capacitive touch screen.

3.2.3 Optical Touch screen

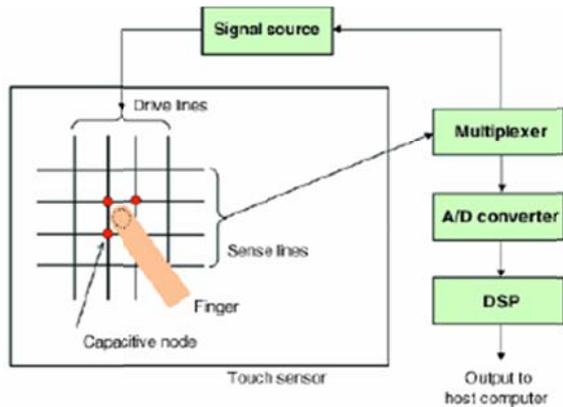


Figure 7. Optical touch screen

Source: http://www.informationdisplay.org/issues/2007/05/art4/GIFS/p79_tif.gif

The optical touch screen uses an array of infrared LEDs on two adjacent vertical edges of the display. And infrared sensors are placed on the two opposite edges to analyze a touch event and position. The LED and sensor pairs can create a grid of light

beams on the display. When an object touches the screen, it will interrupt the light beams. The corresponding sensor can measure the decreasing light beam. Therefore, the sensor outputs can be used to locate a touching point coordinate. Figure 7 presents an example for touch at an optical touch screen.

3.2.4 The Comparisons of Touch Screen Technologies

The resistive and capacitive touch screens are used for general consumer product such as mobile phones, GPS navigation devices, and PDAs. The optical touch screen technology is usually used for a large screen such as a projector. Table 3 is the comparisons of touch screen technologies .

Table 3. The comparisons of touch screen technologies

Optical Touch Screen	Resistive Touch Screen	Capacitive Touch Screen	
Sensor Technology	Optical interruption	Impedance	Micro electricity
Pressure	No need	Need	Need
Response	Quickly	Slowly	Medium
Surface Pollution	No effect	No effect	Effect
Endurance	Good	Bad	Bad
Surface Texture	Any surface	Electric conductor	Electric conductor
Screen Size	Up to 200 inches	Less than 21 inches	Less than 32 inches
Drawback	The size of LED is bigger than other technology.	It becomes inaccurate for long time usage.	It is inaccurate because of temperature difference.

Source : IEK , 2006/04

4. Implementation methods

This software was created based on the Stanza, which has the following advantages:

1. Support Chinese display, a variety of formats, making the e-book cover art support, chapter index, in accordance with the author, style index;
2. Support multi-platform, iPhone, Mac, Windows

always have the client software, and supports multi-platform environment, sharing books wifi.

3. View the cover support Coverflow mode, load books to read when a little after a few seconds when the very smooth, books, you can set the background color, font, font size and color, line spacing, etc., control is very simple, click to the left of the screen front page, click on the back right of the screen page, click on the

middle of the screen display the toolbar.

- You can add online stacks address, download books online in a timely manner.

Chunghwa Telecom has launched the Hami only for the major bookstores for book publishers and the implementation of a machine shelf of a book in

confidence; care of the following works with BabyShan company Epub Pocket Shuyuan (<http://books.80.hk>) for the classification of books and upload the download location settings.

Produced the following to Apple, the Iphone touch mobile phone as an example.



1. OpenStanza



2. Into the palm Shuyuan



3. Into line stacks



4. Choose books



5. Download Books



6. Display Books Introduction



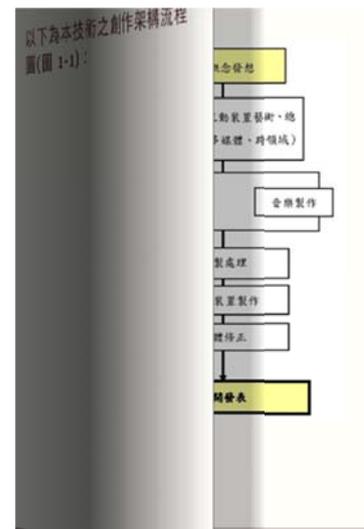
7. The display list of different books



8. Open Books



9. Shows the way of reading book



10. The form of books read

5. Results and discussion

Works in recent years, interactive computer vision, also the use of physical media and digital work mode of operation. The use of life around the works of 3C products to increase the interactive features of the game, through this interactive installation design and the actual show we can find, the physical interface and digital interactive installation that works with the concept can be successful in attracting viewer.

Random in life to show their creativity in the interactive book viewer will want to observe that many of the digital work on the device to intuitively read the device object. Through the object to affect the behavior of digital works. Later studies can add more elements of this work diversity of digital elements such as design, personalized, interactive and diverse sensing device design, interactive design work for future development as a research reference direction.

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A Preliminary Study of the Influences between New Media Art Education and Art Creation in Taiwan

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Recently, the new media art becomes more and more highly-regarded. That new media art development in Taiwan has a strong connection between art education and art creation. This research aims to clarify how the new media art education and art creation influence each other. By using literature review and expert interview method, the researcher investigates and categorizes the key factors of the influences. The results from literature review analysis and the information collected from interview survey will be integrated. The purposive sample of 16 experts participated, the concept of factors and relative values were explored. Results from expert interview indicate how new media art education and art creation influence each other. It is certain that artist teachers are the main guide of new media art creation and government policy influences higher education plan goal and the nation's prospect.

Keywords: new media art, art education, art creation, expert interview.

1. Introduction

New media art in Taiwan has highly regarded and welcomed in recent years. Young artists devolve themselves into new media art of video art / video installation, digital image, web art, interactive art, kinetic art...etc. Art exhibition welcomes this emerging idea and become essential. Early from 1979, Taiwan first Laser art of Mr. Yang Yingfeng and Ms. Xi Murong had delighted the world with hi-tech art possibilities. In the early 90', many artist teachers returned from abroad aroused the enthusiasm in new media art. Nowadays, we can see this influence from new media art education.

2. Literature Review

The history of Taiwan new media art starts from 1977 Mr. Yang Yingfeng held "the laser promotion association" the first preparatory conference to introduce Taiwan the laser art and the technology. Several laser art and kinetic art shows happened after that in late 70' to 80'. In the 90', artist teachers like Mr. Yuan Guangming, Mr. Yuan Guangming, Mr. Wang Junjie, Ms. Pey Chwen with new idea of the field returned from abroad.

Public museum and new alternative spaces IT Park

gallery, SLY Art Space, ETAT Lab provide very good experiment space. Private art foundation and association also play important roll. They are ADAC, Acer Digital Art Center, DIA art education foundation, Fubon art foundation. National art and cultural foundation is the semi-private foundation. Many profound and large-scale international new media art exhibition supplied opportunity for Taiwan artist to observe and emulate. The second : time based art from the Netherlands held in Taipei Fine Arts Museum, 1998; Navigator digital art in the making held in National Taiwan Museum of Fine Arts, 2004 and Climax-The Highlight of Ars Electronica, 2005 are important representative works.

3. Research Method

This research is using literature review and expert interview method. Literature review provides ideas for expert interview guideline. The purposive sampling of 16 subjects includes 8 experts in art education and 8 experts in art creation of new media art. The expert sampling as purposive sampling involves the experts with demonstrable experience and expertise in particular area. Expert sampling can provide following two advantages.

First, it guarantees the best way to elicit the expert viewpoints so that this purposive sampling become essentially and promising. The second reason of using expert sampling is to provide evidence for the validity of expert in the field. Expert panel consisting of acknowledged and accepted person can examine your modal definitions and comment on their appropriateness.

3.1 Expert Interview Guideline

After reviewing related literature of new media art and its developing tendency in Taiwan, the researcher analyzed the various factors later on scheme out the expert interview guideline listed below:

Table 1: Expert Interview Guideline

Expert Interview Guideline	
<p>This expert interview guideline is for the subject of research: A Preliminary Study of the Influences between New Media Art Education and Art Creation in Taiwan. The guideline contains two parts. First to 7th question is constitutive one. Last question is an open-ended question to collect comprehensive potential opinions.</p>	
1.	What is the factor(s) that influences new media art development in Taiwan?
2.	According to your own experience, what is the relation between art creation and art education in Taiwan?
3.	Do you agree with that the aesthetics of new media art in Taiwan has been established?
4.	What are the specific technical characteristics of new media art creation in Taiwan?
5.	What is the present situation of new media artist cultivation in Taiwan?
6.	How does the new media art education and the development in Taiwan relate to each?
7.	What is the present situation of new media art educator cultivation in Taiwan?

3.2 List for expert interview

The subjects of experts interview include 8 experts in art education and 8 experts in art creation. The experts are purposive sampled to promise the best information of interview obtained with appropriateness. Experts in art

education consist of specialists in art education of artistic creation and exhibition, art history and critique, curating and art administration listed as Table 2: List for expert interview -art education in new media art.

Table 2: List for expert interview -art education in new media art

List for expert interview -art education in new media art			
No	Specialty	Year of professional	Interview Date-2011
A	art history and critique,	15	scheduled
B	creation and exhibition	10	scheduled
C	art history and critique,	10	scheduled
D	art history and critique,	10	scheduled

E	curating and art administration	20	scheduled
F	curating and art administration	5	scheduled
G	curating and art administration	15	scheduled
H	creation and exhibition	10	scheduled

Experts in art creation consist of specialists in art creation working with video art / video installation, digital image, web art, interactive art, kinetic art listed as

Table 3: List for expert interview -art creation in new media art.

Table 3: List for expert interview -art creation in new media art

List for expert interview –art creation in new media art			
No	Specialty	Year of professional	Interview Date-2011.
a	video art / video installation	8	scheduled
b	video art / video installation	8	scheduled
c	digital image	15	scheduled
d	video art / video installation	10	scheduled
e	web art	10	scheduled
f	interactive art	8	scheduled
g	kinetic art	8	scheduled
h	kinetic art	8	scheduled

3.3 Analysis and key words of expert interview

The 8 expert interviews of art education in new media art and the 8 expert interviews of art creation in new media art provide rich information data. The data will be typed with the record into verbatim after each interview. Key sentences will be extracted from verbatim. After analyzing key sentences with related literature, key words represent the factors of influences between new media art education and art creation in Taiwan.

4. Research result

After 8 expert interviews of art education in new media art and 8 expert interviews of art creation in new media art, the verbatim from recording manuscript is about 149,764 Chinese characters words data. Key sentences will be extracted from verbatim and analyzed with related literature to obtain the factors of influences between new media art education and art creation in Taiwan.

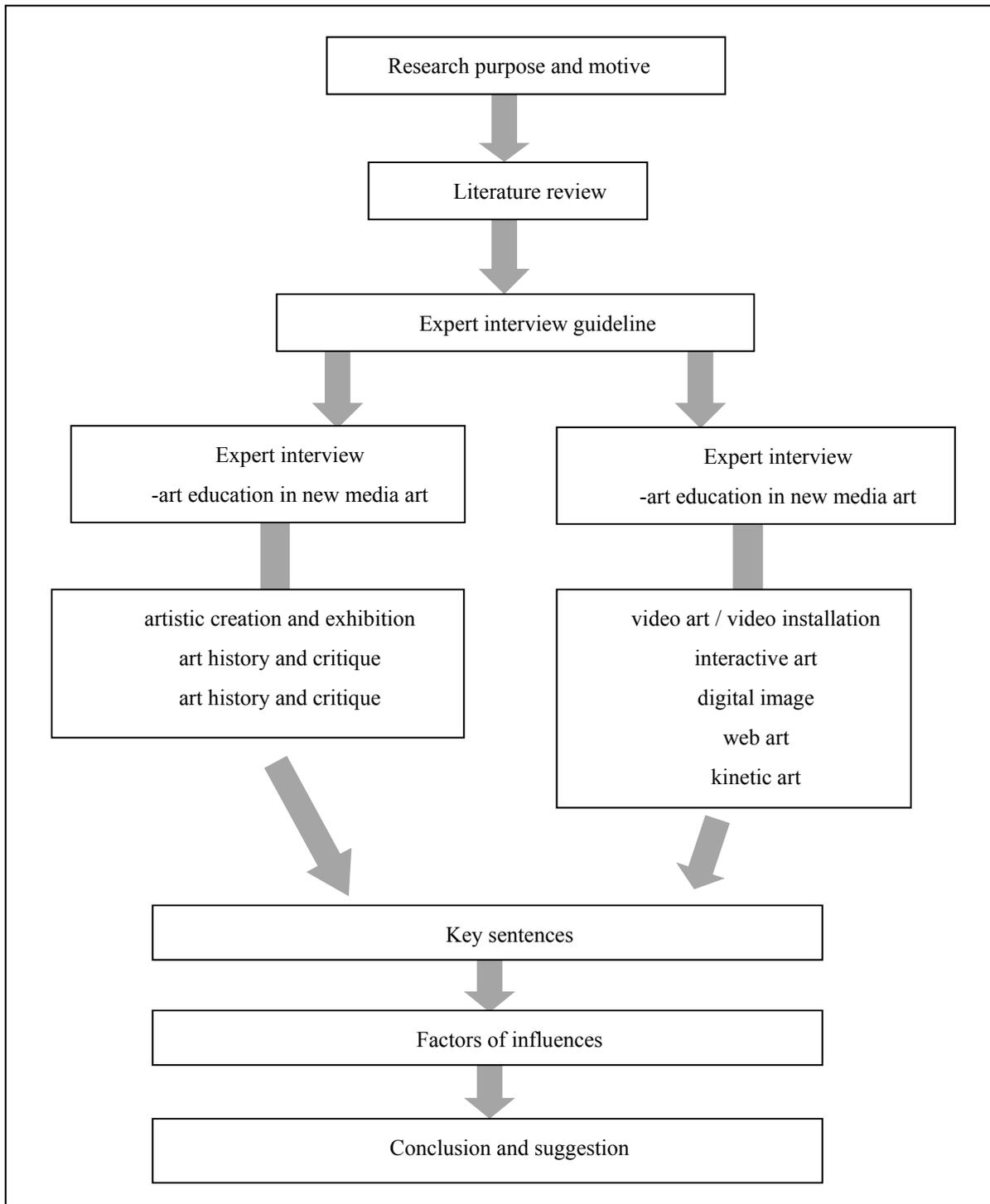


Figure 1: The research construction flowchart

Table 4: Factors of influences

Expert Interview Guideline	Factors from expert of art education in new media art	Factors from expert of art creation in new media art	Factors in common
1. What is the factor(s) that influences new	<ul style="list-style-type: none"> ● New media art exhibition invited into TW ● Artists/ teachers return 	<ul style="list-style-type: none"> ● Material evolution history ● Artists/ teachers return 	<ul style="list-style-type: none"> ● Artists/ teachers return from abroad ● Emerging department of

<p>media art development in Taiwan?</p>	<p>from abroad</p> <ul style="list-style-type: none"> ● Emerging department of new media art ● Daily Experience if hi-tech ● Cultural policy ● Enterprise support 	<p>from abroad</p> <ul style="list-style-type: none"> ● Emerging department of new media art ● TW is a technology island ● Public assistance ● New media art exhibition invited into TW ● Professional reference introduced ● Technical accomplishment is good ● Equipment with fair price ● Cultural policy 	<p>new media art</p> <ul style="list-style-type: none"> ● New media art exhibition invited into TW ● Cultural policy
<p>2. According to your own experience, what is the relation between art creation and art education in Taiwan?</p>	<ul style="list-style-type: none"> ● New media art education ● Media cognition ● Conformability ● The resources are deficient ● New media mainstream ● Technology is easy to obtain ● Conceptual art ● Resource distribution ● Educational trend ● Digital art and digital technology are confused ● Teacher's guidance, 	<ul style="list-style-type: none"> ● Teacher's guidance, especially teacher newly returned from abroad ● New media mainstream ● Educational trend ● Student's creation ● Political art ● Domain conformity ● Associates study ● Don't be limited by competition 	<ul style="list-style-type: none"> ● New media mainstream ● Educational trend ● Teacher's guidance
<p>3. Do you agree with that the aesthetics of new media art in Taiwan has been established?</p>	<ul style="list-style-type: none"> ● Creation trend ● Phantom aesthetics ● Aesthetics viewpoint ● Cultural difference ● Symbol of the time ● Economic system ● Bodily sensation ● Materialism ● Globalization ● Aesthetics of new technology 	<ul style="list-style-type: none"> ● Textbook ● Not yet has Taiwan aesthetics viewpoint ● Commentary prize ● Using digital product experiences ● Pursues the technology ● Aesthetics of new media is still in ignorant stage ● Digital art festivals ● Digital art center 	<ul style="list-style-type: none"> ● Not yet has Taiwan aesthetics viewpoint

	<ul style="list-style-type: none"> ● Not yet has Taiwan esthetics viewpoint 	<ul style="list-style-type: none"> ● Culture colonization ● Hybrid 	
4. What are the specific technical characteristics of new media art creation in Taiwan?	<ul style="list-style-type: none"> ● Equipment of school ● Primitive method ● Programming language ● Technical threshold ● The artist and the technical personnel coordinates ● Low tech ● Government impetus 	<ul style="list-style-type: none"> ● Foreign experience ● Equipment of school ● Study independently ● Technical threshold ● The artist and the technical personnel coordinates ● Low tech ● Government impetus ● The technology admires others ● Analogy ● Art lab ● Art consultant ● Research and development dept. 	<ul style="list-style-type: none"> ● Equipment of school ● The artist and the technical personnel coordinates
5. What is the present situation of new media artist cultivation in Taiwan?	<ul style="list-style-type: none"> ● Creative artist ● Government supports ● Digital art center ● Art education ● College education ● Industrial engagement ● content creativity profit increment ● Graduation and unemployed ● Artistic creativity and employment ability 	<ul style="list-style-type: none"> ● Creative artist ● Technical thinking ● College education ● Artistic creativity and employment ability ● Lab ● Biennial ● Policy resources ● Technician ● Private collection ● Earn money be design project to support art creation ● Spontaneous enthusiasm 	<ul style="list-style-type: none"> ● Creative artist ● College education ● Artistic creativity and employment ability
6. How does the new media art education and the development in Taiwan relate to each?	<ul style="list-style-type: none"> ● Educational environment ● Art prize and award ● Government policy ● Technical threshold ● Exchange between comrades ● Cultural creativity 	<ul style="list-style-type: none"> ● Educational environment ● Art style ● Government policy ● Creativity ● Limited resource /budget ● Art teacher ● Technical teacher 	<ul style="list-style-type: none"> ● Educational environment ● Government policy ● Limited resource /budget ● Art teacher ● Technical teacher

	<ul style="list-style-type: none"> ● industry ● Art teacher primarily ● Technical teacher secondary ● International information communication ● Limited budget 	<ul style="list-style-type: none"> ● Art critique ● Curating 	
7. What is the present situation of new media art educator cultivation in Taiwan?	<ul style="list-style-type: none"> ● Professions is obviously insufficient ● Well established media center ● Teacher is student's example ● Teachers serious insufficient ● Young artist, school artist is more active out ide the school ● Art teacher and technical teacher ● Technical guidance ● Esthetics of technics 	<ul style="list-style-type: none"> ● the outflow of educational talent ● Well established media center ● Commercialization ● Art teacher and technical teacher ● Artist training ● Technical guidance ● Esthetics of technics 	<ul style="list-style-type: none"> ● Well established media center ● Technical guidance ● Esthetics of technics
8. Other supplement you are willing to offer to the domains	<ul style="list-style-type: none"> ● School system ● Funds insufficiency ● Lab is necessary ● The technology and the creation cooperate ● The artist and engineer cooperate ● Art teacher has the extreme influence ● The domestic artist with the performance opportunity 	<ul style="list-style-type: none"> ● New media development ● The artist and engineer cooperate ● Artist idea matters ● Art teacher has the extreme influence ● Coordinated, elasticity ● Art teacher has the extreme influence ● The money spends to matter ● Broker system 	<ul style="list-style-type: none"> ● The artist and engineer cooperate ● Art teacher has the extreme influence

5. Conclusion

In the research result, some important factors repeat in different section such as new media art exhibition invited into Taiwan; artist/art teacher return from abroad;

emerging department of new media art. Those provide early time of new media art valuable nutrients. In addition, factors in common from expert interview guideline 1 to 8 indicate the specialty and treats place of the improvement.

Table 5: Factors in common from able 4

	Factors in common
1	<ul style="list-style-type: none"> ● Artists/ teachers return from abroad ● Emerging department of new media art ● New media art exhibition invited into TW ● Cultural policy
2	<ul style="list-style-type: none"> ● New media mainstream ● Educational trend ● Teacher's guidance
3	<ul style="list-style-type: none"> ● Not yet has Taiwan esthetics viewpoint
4	<ul style="list-style-type: none"> ● Equipment of school ● The artist and the technical personnel coordinates
5	<ul style="list-style-type: none"> ● Creative artist ● College education ● Artistic creativity and employment ability
6	<ul style="list-style-type: none"> ● Educational environment ● Government policy ● Limited resource /budget ● Art teacher ● Technical teacher
7	<ul style="list-style-type: none"> ● Well established media center ● Technical guidance ● Esthetics of technics
8	<ul style="list-style-type: none"> ● The artist and engineer cooperate ● Art teacher has the extreme influence

5.1 Artist teachers is the main guide of new media art creation

Artists/ teachers return from abroad and teacher's guidance are mentioned over and over. Even later on, department of new media art and related domains always consist of art teacher and technical teacher. One subject even answered that aesthetics of new media art in Taiwan has not been established because too much works are similar to their teacher's.

5.2 Government policy influences higher education plan goal and the nation's prospect

New media art development is relative to government

policy of cultural annual budget, higher education plan goal and the nation's prospect. New media art sometimes costs a lot for hi-tech equipment or interdisciplinary collaboration. Media lab for new media art experiment also needs strong financial support. In the interview, more than one subject sighed out the situation of resources lack. Only when the government policy is steady and the resource is abundant, new media art can show its blossoming and bearing fruit.

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Writing Design Process with 3D Geometry Diagrams

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The role of Diagrams in terms of spatial transformation represents a bridge for addressing the issues of visual impacts and computational mechanism. Designers used to develop design with diagrams, and a design process also can be constructed by the composition of its spatial transformation diagrams (3D diagrams). An analysis framework is proposed in this paper for organizing spatial transformation by Following *Component + Operation = Syntax of process*. Inspired by Eisenman's House IV diagrams, we develop several interfaces in Java for the purpose of collecting 3D transformation diagrams. Firstly, using one of the cases as reference to reason and analyze the elements of design process, we suggest a mechanism for describing design process with diagrams. Secondly, conducting a computing device for collecting the spatial transformation diagrams represents the possible diagrammatic logic among design. In addition, the compositions of components and operations are used to re-capture the sense of original design process. The system can deduce the design information management system from analyzing spatial transformation system.

1. Design as Exploration with Diagrams

Designers used to apply appropriative rules within design requirements and to exploit the different condition (geometry) of design by analogy, then, represented by a series of geometry diagrams during design process. At the moment, diagrams are regarded as knowledge representation for memorizing the design process. Following Woodbury's definition (1996), a simple design exploration algorithm that provided an informal formula to convey this logic system of internal thinking with incremental exploring behavior:

$$\textit{Representation} + \textit{Rules} + \textit{Memory} + \textit{Policy} = \textit{Search} \equiv \textit{Exploration}.$$

Brief speaking, knowledge representation is used to describe internal content of data structure in designing; Rules is presented the concurrent state of design transformation; Memory is responsible for recording entire design processes and relative positions of design spaces; Policy is used to serve as the procedural control of design processes.

There are several relevant researches regarding of diagrams or diagram-like reasoning, such as (1) case studies of formalization theories (Flemming 1987,

Knight 1981); (2) studies with computational modes and representation models (Gero and Kazakov 1996, Heisserman 1994); (3) studies with implementation of design space explorer (Chang 1999, Flemming 1989). Most are with geometry one way or another. The reasoning is often connected with spatial transformation and the frequently used process of finding the computing method is simulation.

Spatial transformation (especially 3D transformation), then, appears to be a valuable tool as a key to understand either design composition or design process. Since we know the effective way to comprehend someone's design process are 3D spatial transformation diagrams. From the beginning till the end of design process, designer used to figure and collect ideas with many diagrams, those diagrams can be regarded as the same kind of knowledge representation, and designer also can compose diagrams into diversely results.

For this reason, if spatial transformation can be translated into knowledge representation, the 3D transformation diagrams of design process should be memorized. However, as we know, the computational mechanism is lack of representing both the reasoning and transforming geometry. The role of Diagrams in terms of spatial transformation represents a bridge for addressing

the issues of visual impacts and computational mechanism. Furthermore, a design process can be constructed by the composition of its spatial transformation diagrams (3D diagrams). As what's mention above, the two objectives of this paper is:

- (1) Trying to find a suitable analysis methodology for describing design process
- (2) Conducting an interface for collecting the spatial transformation diagrams in computational way to code parts of knowledge representation that designers truly need.

2. The Steps

For the objectives described above, we develop an analysis methodology and the research steps for understanding the problem addressed above. This research is based on 3 steps.

Firstly, for the first objective, we analyze the chosen design cases and trace the description of the design process following the writing and published diagrams from designer. Then we model some rules from analysis results and construct the design components by the way of multiform operations and develop succession rules of operators over components from the observation of rereading the design process.

Secondly, to achieve another objective, based on the first objective, we develop a spatial transformation system that established within user analysis and system implementation. Finally, giving a process simulation example to inspect the rules and sequence we made.

3. Analysis The Diagrams

3.1 Case selection

This research needs a suitable case that should follow two principles for case selection. First of all, the cases selected shall contain enough diagrams (especially 3D diagrams) to allow people to interpret or figure out the design developments as well. Secondly, the design process should have other information such as writing

from designers for describing the diagrams from designer's original thoughts. With such criteria, House series from Peter Eisenman not only kept the completed design process description, but we can also explore more development of design from these design process diagrams.

From House I to House V (Eisenman 2003), Eisenman has applied several geometric transformation principles to construct these diagrams. The particular operations applied are: Transformation, Marking, Shifting, and Doubling. Till House VI, Eisenman realizes that each operation will not go through itself alone to complete whole design work, it must mix operations with each other and require additional new operations: Inversion and Slippage. Therefore, House VI and after will be more appropriate for our task. In addition, Eisenman stated his house style, a representative work—House X, was known widespread by his individual style. In summary, House VI made an obvious demarcation to converge several simple operations of cases before House VI, and use the rules continue to develop House X successfully. Therefore, this research starts with House VI's diagrams and extends the pattern to House X.

3.2 Simulating the design process of case study

From the diagrams of House VI, we discover that designer (Eisenman) constructs the design with components under multiple operations and represented by several 3D diagrams. In order to understand the computability, especially the geometric transformation, of the diagrams, we take key parts of diagrams as the resource for reproducing the geometry using CAD software such as 3D MAX. With such simulation, we are able to reason the design process of House VI. The simulation steps are shown as follow.

To begin with the design, diagram starts with a foundational frame of the cube by dividing it with 3×3 (9 grids) on top plan and 3×2 on side plan. Afterwards,

designer followed the resembling proportion to operate transited form (Figure 1).

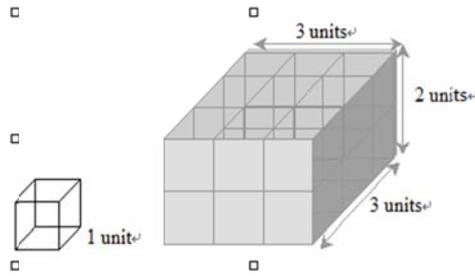


Figure 1. The Foundational Frame of the cube.

The following 3 tables (Table 1-3) describe the reasoning process of simulation for 12 steps shown in House VI's diagrams.

The initial process that is from Step1 to Step 4 (in Table 1) is when the designer constructs original framework. By overlapping and shifting 4 frames of the cube, the frame acquires proportion under form relationship, and develops the extended form based on this proportion with designer's operation, such as Doubling, Slippage and Framing.

Continue to Step5 to Step 8 (in Table 2), the form transition is inversed, also to be regarded as taking off

the layer (frames of cube). The attention changes from the 4 frames of the cube to the new thicker frames. At Step 5, the frames of Step 4 are transformed into physical walls. In this phrase, the practical components have emerged in the diagrams, for instance, walls, columns, and opening. From Step 5 to Step 8, the operations are Inversion, Slippage, making opening, and setting columns.

From steps 9 to 12 of design process, simulation (in Table 3) completes main space and form. The developments of 3D spatial transformation are described in the diagrams of Table 3.

Table 1: Step1~4 of design process simulation.

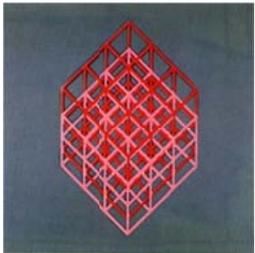
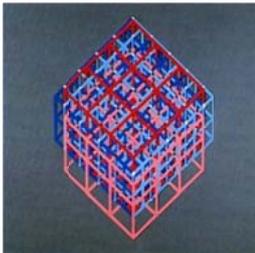
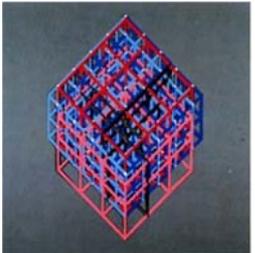
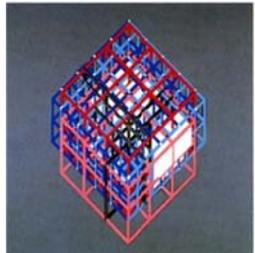
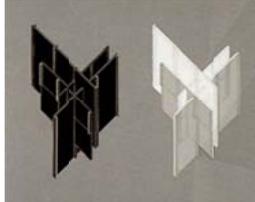
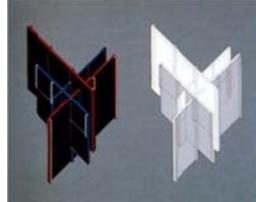
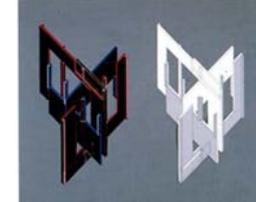
Step 1.	Step 2.	Step 3.	Step 4.
			
Each step of operation			
Doubling & slippage	Doubling & slippage	Framing	Null

Table 2: Step5~8 of design process simulation.

Step 5.	Step 6.	Step 7.	Step 8.
---------	---------	---------	---------

			
Each step of operation			
Inversion	Slippage & set columns	Opening	Opening

One example of the designer's operation rules—opening is shown below. In this operation, designer makes openings on blue walls and red walls with different way. According to the Step 7 and 8 (in

Table 2), the columns is set according to the wall's trisection, but we notice the size of opening is dissimilar either blue or red wall (Figure 2).

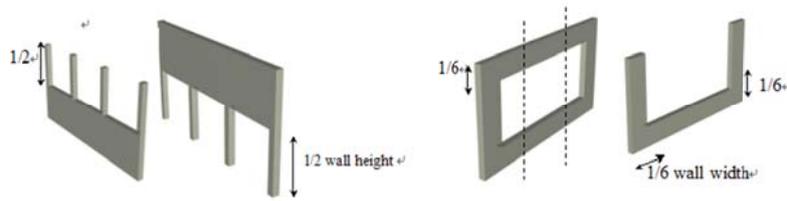
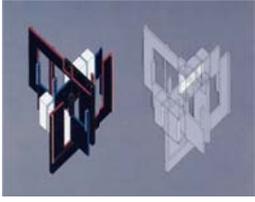
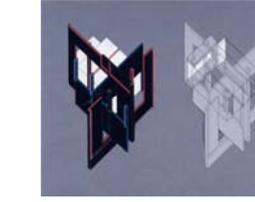
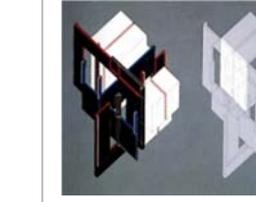
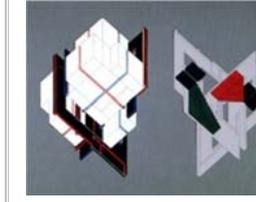


Figure 2. Left: The opening style of blue wall; Right: The opening style of red wall

Table 3: Step9~12 of design process simulation.

Step 9.	Step 10.	Step 11.	Step 12.
			
Each step of operation			
Box generating	Box generating	Shifting & slippage	Null

A brief summary after the simulation, the design process composed by aggregation of 3D diagrams is organized and represented several design components and operations. Furthermore, the expression of diagram can be regarded as: *Component + Operation = Syntax of design process.*

3.3 Classifications

3.3.1 Syntax of design process

By analyzing the domain resources step-by-step, we interpret every step of the process usually includes components and diagram generation steps by means of

operations to generate and edit the components; in another words, it can be regarded as: *Generation+ Edition= Operation.*

Therefore, we develop a mechanism for analysis spatial transformation diagram. An analysis model is proposed in this paper for organizing spatial transformation.

$$\text{Component} + \text{Operation} (\text{Generation} + \text{Edition}) = \text{Syntax of design process.}$$

We believe *the syntax of design process* can organize spatial transformation. So we consider that the design process should be taken apart to several

components and operations. Besides, if we can hold this hypothesis true, there is a chance to say, collecting 3D spatial transformations diagrams in computing way can “write down” the design process.

3.3.2 Three elements compose syntax of design process

Component: By classifying 3D diagrams from Eisenman’s House IV, three basic components (shown in Figure 3) are: (1) Cube, (2) The frame of the cube, and (3) Wall. Regardless which component, it still requires generation or edition (operations) to transform the components into an appropriate form. In addition, The Component is the primary and essential element of all.

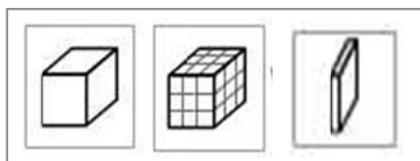


Figure 3. The Components of House IV

Generation: The operation includes generation and edition. Making a clearly definition both of them. The generation emerges some designer’s style similar to designer’s rules. The *Designer* used to transform ideas to alternative 3D diagrams. In the process of transformation, designer has his or herself to compose components by designer’s rules (reasons). In this case we develop 9 generations according to House VI’s diagrams. They are (1) Doubling, (2) Framing, (3) Slippage, (4) Setting columns, (5) Opening, (6) Box generating, (7) Shifting, (8) Inverse, and (9) Dividing lines.

We had developed succession of generations over components from the observation of rereading the design process. And the rules are written with forward-chaining style (from conditions to actions). An example is shown in Table 5.

Table 5: One example: the rule of “Doubling”.

Generations	Condition	Action	Diagrams
Doubling	Selecting a Solid	1. doubling the selected solid 2. Doubling a new solid with similar color with the selected solid 3. the new solid distance from the selected solid 1/6 solid width (x, y, z axis random)	

Edition: analyzing any one of generations, actually it has involved some actions in side such as move, rotate, undo and scale, i.e. those actions won’t really change component’s attribution, just editing component’s position, size or color, i.e., that we called “Edition”.

The editions are separated from generations as the nature of edition is directly changing the geometry while generation will be fired according to different condition. Some editions might appear several times for making alternatives. In House IV, we state at least more than 8 editions, such as (1) Move, (2) Rotate, (3) Erase, (4) Color, (5) Layer, (6) Scale, (7) Tag, and (8) Boolean.

3.4 Analysis procedure of reasoning a design process

For the first purpose of finding a suitable analysis methodology for describing design process, we

recommend an analysis procedure while reasoning a design process as followed:

- (1) Data collecting: collecting adequate diagrams (especially 3D diagrams) for assistance of reasoning design process. In addition, gathering designer’s writing about the case in case of misunderstanding designer’s original thoughts.
- (2) Simulation: simulating the process step-by-step and writing down the changes.
- (3) Following the model *Syntax of design process*: inducing the main components and operations

(generations and editions) from the simulation.

- (4) Classifications: researchers can analyze the details of components and operations to examine the process and refine the process uncovered above.
- (5) Other frame works: the components and operations could be re-applied as designer's elements. For instance, to construct styles design or to implement a system which keeps several components and operations as a reasoning engine of this paper's second objective.

4. A diagram writer program

4.1 A writer's behaviors

The role of diagrams is a bridge for representing the issues of visual impacts and computational mechanism. If a design process can be constructed by the 3D spatial transformation diagrams composition in computing way, the design process could be recorded as well as designer can reason the design process more easily. One immediately goal for reaching this objective is to

conduct a reasoning system with a specialized interface for collecting the spatial transformation diagrams for encoding parts of design knowledge.

Firstly, such interface should imitate a designer as a diagram writer to search the requirements of the system. We arrange four main behaviors of a diagram writer: (1) Making a diagram. Basically the writer needs to make one by one diagram to organize his or her own narrative. (2) To picture one single diagram. The writer needs to picture the key diagrams for directing the design development. (3) Viewing and making the rules. The writer should allow designer to view and make personal rules in the design. (4) Visualizing the Tree/path as a narrative writing. A diagram writer needs a visualized vision to reason and recall the design process what he or her has done.

4.2 System framework

Base on the writer's behaviors as we discussed, we continue to design a system framework (Figure 4).

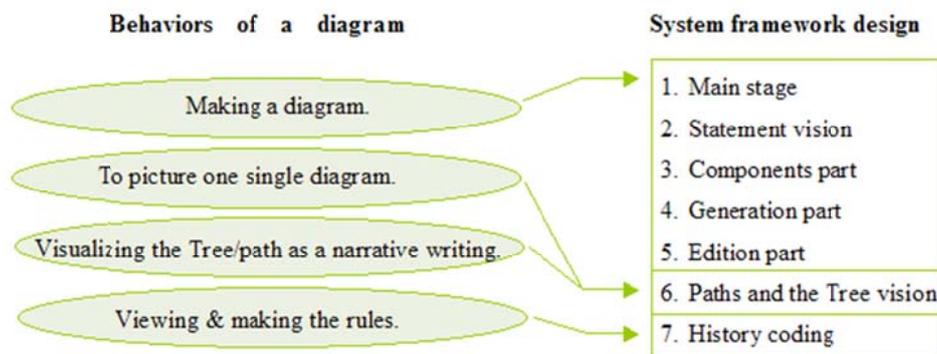


Figure 4. Mapping from diagram writer behaviors to the system framework.

For the second objective of designing a system as a diagram writer program for collecting 3D transformation diagrams, we planed seven parts of frame to construct a diagram writer program interface.

- (1) Main stage (The geometry making stage)

The stage is the main vision part to observe geometry's changes. Besides, the geometry that designer made could be a single diagram, as pictures a vision of the geometry's statement.

- (2) Statement vision

In this statement vision part, user can see the smaller vision from main stage to inspect the location from siteplan way.

- (3) Components part

There are three components in House IV such as (1) Cube, (2) The frame of the cube, (3) Wall. The component part provides the essential geometry to construct the final form by several generations and

editions.

(4) Generation part

Geometry will be transformed through at least one generation's conducting. Designers can use generation to operate geometry. The generation emerges some designer's rules such as the designer's style.

(5) Edition part

Edition as well as Generation belongs to operation. The options here won't give the geometry's attribution changes, only editing position, size, color and so on.

(6) Paths vision and the Diagram tree window

Sequence of diagrams is viewed as a path. One path records one development from the beginning to the end. However, a completed design process supposed involves several paths to go along with. Hence, several paths compose the tree of a design

process and we can also figure out the design process from those narratives of paths.

(7) History coding

This system should take down every action during design process. Designer can see the histories to infer design process and notice self-behaviors in the process.

4.3 Interface

For realizing the interface and the reasoning behavior of interest of this paper, we implement a system called 3D Geometry Writer. It has several components including reasoning engine, a rule making facilities, a solid modeler and a rule-bases. We design five windows: main window, component selecting window, generation prompt window, edition prompt window and diagram tree window in this 3D Geometry Writer, there are some instances as shown in Figure 5, 6 and 7.

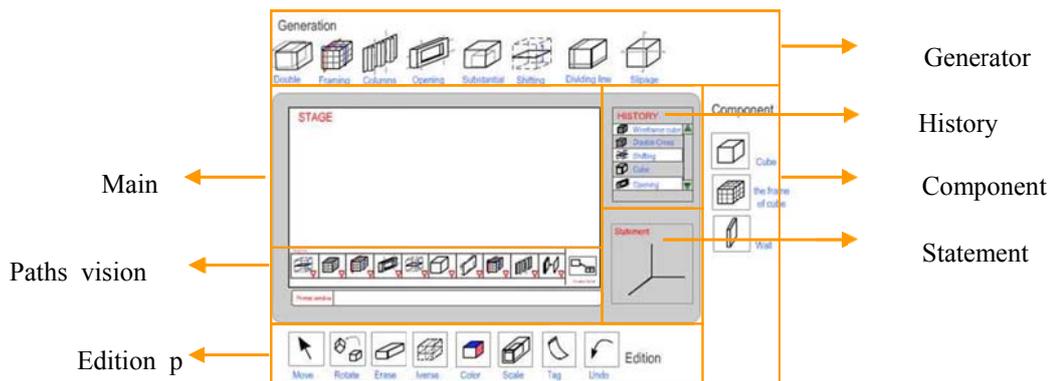


Figure 5. The main window of 3D Geometry Writer

The rules of generations are written with forward-chaining style (from conditions to actions). So that the generation prompt window is designed for aiding user to make decisions from the generation's conditions and actions. One of the examples as followed (Figure 6 and 7).

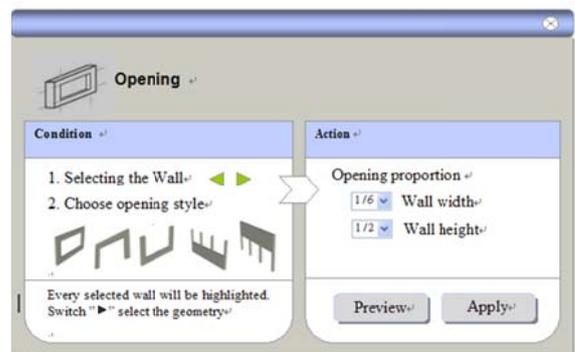


Figure 6. Generation prompt window.

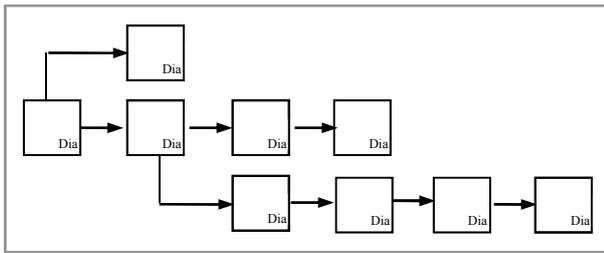


Figure 7. Diagram tree window.

5. An Example

In the end of this paper, we provide a simulation example

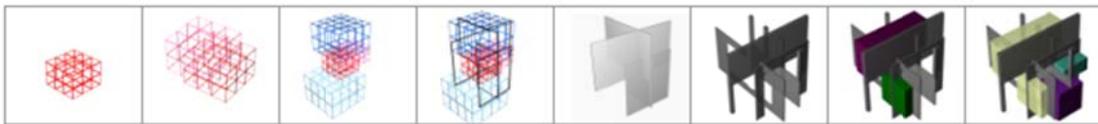


Figure 8. The main path records main design development.

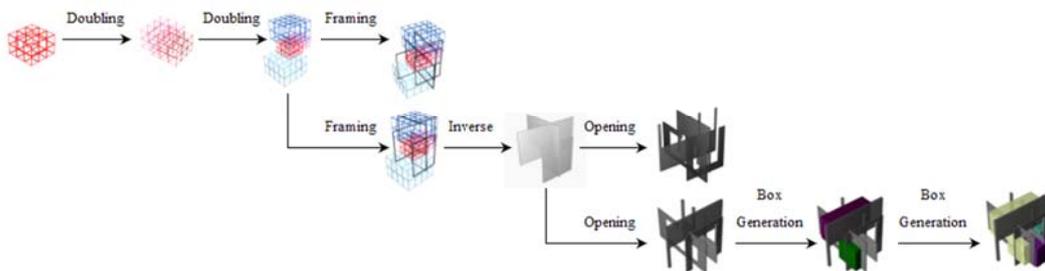


Figure 9. A diagram-tree window of the simulation example

The usage of 3D Geometry Writer interface can collect the spatial transformation diagrams and assist designers to have alternative compositions of components of knowledge representation. Furthermore, our system can deduce a linkage from analyzing spatial transformation system.

6. Conclusion

By analysis the domain resources, we develop a mechanism for analysis spatial transformation diagram under an analysis framework *Component + Operation (Generation+ Edition) = Syntax of process*. In this paper we exploit the interface and a system for the purpose of

of 3D Geometry Writer engine. A designer can organize spatial transformation diagram in the main stage based on the analysis model: *Component + Operation (Generation+ Edition) = Syntax of design process*. The main path vision of design process diagrams will be placed under the main stage window (Figure 8). And designer could see the whole geometry development through operations from the diagram-tree window (Figure 9).

representing design process with 3D transformation diagrams other than just an Eisenman's House IV simulation. The objectives of this paper aren't making a tool of imitating Eisenman or someone's design. However, using one of the cases as reference to reason and analyze the elements of design process, we suggest a mechanism to represent design process with 3D diagrams composition. In another words, the purpose is to find a suitable analysis methodology for describing design process. Furthermore, with such analysis, we are able to conduct a system for collecting the spatial transformation diagrams to encode parts of knowledge that designers have implied in their diagrams.

An advantage of the purpose not only aids designers to write out alternative compositions of components, but the system also codes the 3D diagrams with paths. In addition, the system can deduce the design information management system from analyzing spatial transformation system; and also can re-capture the sense of original design process obviously. But, there are still some limitations in this research. For instance, this paper just selects one case with simple design process. When applying the mechanism in multiform cases, the system will be more complex. The interface of the diagram writer should make adjustments through user's comments and evaluate the efficiency. Here is one way of the future work of the 3D Geometry Writer may provide a construction to a beginner for producing styles and examining self-design process.

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Professional Proficiency of Design Talents in Digital Content Industry—Research Examples from Digital Games and Computer Animation Industry

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After Executive Yuan of Taiwan included Digital Content Industry as one of Taiwan's development priorities, huge amount of educational resources were plunged into the industry; however, there still remains the problem of the lack of professional talents in the industry. From the requirement aspect, we collected the data through interviews and questionnaire survey to analyze the contracture of digital content industry. We found the professional proficiency of the talents of art and planning in the industry of Games and Animation.

1. Talents requirement of Games and Animation Industry: since games industry is similar to animation industry, they all need the talents for supervision, preproduction design and production development.
2. Requirements for professional proficiency: Basic skills included the passion for works, creativities and communication skills. Professional skills, which means the proficiency for accomplishing tasks, is required based on different field of the industry. Interdisciplinary Integration, a skill to integrate ideas from different field, to communicate and to produce. A talent of interdisciplinary integration usually owns rich practical experiences and is familiar with other related fields.
3. The cause of the unbalanced supply and demand of talents is based on the lack of quality, instead of the amount. There is a gap between the requirement from the industry and the possession of talents. Developing the quality and professional skills of talents and the cooperation of government official and education are main solutions of the unbalanced supply and demand of talents.

Keywords: digital content industry, animation, games and professional proficiency.

1. Research Background and Motivation

In the digital media world, the widespread of information technology infrastructure changed the modern transmission mode. The general of digital content create huge business opportunities in the digital content related industry, such as computer animation, digital games, digital music and video as well as e-learning.

According to the analysis of Global Entertainment and Media Market, E&M from Pricewaterhouse Coopers Research Company, the scope of global entertainment and media market will grow up to 1.61 trillion US dollar in 2013 from the 1.43 trillion US dollar in 2008. Such an

incredible output value will push other countries to include digital content media as their development priority.

Facing the growth trend of global information technology and knowledge economy, Executive Yuan listed the digital content industry as a national development priority in 2002. Now, the plan of digital content development has entered the second phase. It expects to increase Taiwan's digital content production value from 341.2 billion in 2006 to 600 billion in 2011. In particular, the animation and game industry are considered the main core of the digital content development.

However, the beginning of our digital content

industry development is slow; the competitiveness of globalization will be a major challenge. According to the SWOT analysis of digital content industry conducted by Industrial Development Bureau, Ministry of Economic Affairs, it indicated the cons of Taiwan's development are short of personnel training, lag of technique, insufficiency of firm scale, lack of creativity and so on. In addition, the competitors of United States and Japan are strong which is not good for us. The analysis also pointed out that we have complete infrastructure, close to the Asia Pacific region and mainland China, and understand the demand of customers. There is still a considerable growth in Chinese market.

Digital content industry has two meanings of indicators which are knowledge economy and digital economy. Digital content industry is an intensive knowledge industry required a large number of knowledge workers. The president of General Electric Company, Jack Welch, says “

According to a survey for Taiwan digital content industry supply from 2008 to 2010, (Institute for Information Industry 2007) it predicted that approximately 6200 people will be needed in this field, further education will be provided to around 4600 people and experts shortage is nearly 1600 people.

1.1 Research Purpose

This study focuses on digital games and computer industry in Taiwan and particularly on the aspect of specialists need. It is to discuss the present situation of digital content experts that this industry demands. The research targets are mentioned below:

1. Thorough analysis of present situation in digital content industry and to detect the demand of specialists in this field.
2. To analyze the need in this industry field and to discover the professional abilities that project planners and art technicians should equip.
3. To discuss the reasons of talents supply gap and recommend specific improvement.

1.2 Research Limit and Scope

Owing to the limited time and funds, the study was not able to cover all the fields among digital content industry. Therefore, we listed the scopes and limits as below :

1. Digital content industry widely covers eight major fields. “Games”, as well as “Animation” are two cores with most international development prospects among them all. In view of this, our study emphasizes on “Games” and “Animation” industry to be the key subjects.
2. Three types of nucleus experts of digital content production are in project planning, programs and art. According to the talents supply survey of digital content industry from 2008 to 2010, a number of excellent specialized programmers are cultivated in Taiwan. However, due to the rapid growth of high technology, the situation turns out to be the competition for talented people and specialized programmers hardly join digital content industry. (Institute for Information Industry 2007) The reason for talents shortage is the competition between digital content industry and IT industry, not the discrepancy between “need” and “supply.” Consequently, this study targets “project planning” and “art” specialists as the research scope.

2. References Discussion

2.1 The Present Situation and Development of Games and Animation Industry

2.1.1 Digital Games Industry

1. The Development and Recent Situation of Digital Games

Before 2000 the development of game industry used to be one-on-one games in Taiwan but since the game, King of Kings presented by Larger Network Technologies Inc., it seemed like the gate of online games has been opened. The next year, Wayi

International Digital Entertainment Co., Ltd. introduced the game, Stone Age from Japan while Gamania Digital Entertainment Co., Ltd. represented the Korean online game, Lineage. Meanwhile, Chinese Gamer International Corp. developed “Sango” based on Chinese subjects and other innovative games made an online game sensation in Taiwan. This type of games became the latest craze, in which thousands of players can play on the network and chat with others synchronously and there was a sharp increase of users. The payment method is to charge for time and not only has brought a massive profit but also solved the illegal copies problems in one-on-one games which have existed for quite some time.

The potential for network games prospects look good, numerous Taiwanese game companies started to invest in the growing industry. They strove against each other to be overseas agents. (mainly Korean games) Between 2001 and 2002, in order to expand the market, many companies intended to raise investment money and become listed companies or be over-the-counter. The game output went up 26.4% within the year and online games output got beyond PC one-on-one games so thus turned into the main stream in this market.

2. Trends and Prospects

(1) The Continuing Growth of Online Games

The Pricewaterhouse Coopers analysis report indicates that compound annual growth rate of online games accounts for 16.9%, will be worth 95.7 billion in 2009 potentially out of the global game market which will hopefully reach 683 billion US dollars by the year of 2013.

(2) The Extension of Overseas Markets

Developing overseas markets now has become game companies’ priority since Taiwanese game output growth rate gradually slowed down. For now, mainland China is becoming the core overseas game markets for Taiwan. The present urgent issue is that both Taiwan and China should cooperate and work products feature Chinese

cultures together so as to satisfy the need for both markets and additionally to explore the market share of international markets.

(3) The Popularity of Social Games

The up to date Social Games have been emerging recently. With the widespread use of social websites such as Facebook, MySpace, Bebo, Kaixin and etc., social games are becoming future stars in game industry. Comparing with the most popular online game of all time, World of Warcraft (WOW) which attracts over 11.5 million players from all over the world and reaches 20 billion US dollars in annual revenue, however, the farming game, FarmVille on Facebook has nearly 27 million regular users per month. It is virtually 2.5 times as many as WOW. (Industrial Development Bureau, Ministry of Economic Affairs 2009)

2.1.2 Computer Animation Industry

1. The Development and Recent Situation of Computer Animation

The very first animation in Taiwan must be “Wu Song Da Hu” by the Kwai Brothers. However, what led Taiwan’s animation development was actually the rise of “original equipment manufacturing.” Since 1960s, export orientation was the policy of development in Taiwan. Various household industries were manufactured in Taiwan and exported to places all over the world. Animation was not an exception. The phenomenon of processing and original design manufacture animation in Taiwan had started while Japan had contracted animation since 1970s. Many animation companies like Chinese Cartoon Production Co., Ltd., Far Eastern Animation Tech. Co. and etc. were established in 1970s and some of them tried to make their own animation but “Old Master Cute” (1981) was the only successful domestic cartoon up to now.

In 1978, in order to cope with the great deal of TV animation production, United States began to seek for overseas original equipment manufacturers. The largest

big-scale TV animation company at that time, Hanna Barbera cooperated with Wang Film Productions Co., Ltd. so animation processing industry in Taiwan reached a peak. Until the late 1980s, Taiwan already became the world leading processor of animation.

Nevertheless, the substantial factors in animation original equipment manufacturing production and processing are costs, qualities and efficiencies which had played significant roles in success. From the 80s, overseas entrepreneurs continually looked for sources of animation at a lower price in Asia. (Yu-Sheng Lin 2004) As early as the 80s, although Taiwanese entrepreneurs

discovered the significance of own production, processing solely put a great emphasis on drafting and coloration skills. In the early days, the profession and capability insufficiency in project planning, screenwriting, directing, as well as the short fundraising, all these factors caused the product standard below expectation and our own animation had terrible box office. Taiwan faced the failure in processing market and lacked of dynamic development of domestic-made animation. Consequently, animation output declined each year (See Table 1).

Table 1: General Situation of Animation Output Growth in Taiwan 90-95

Year	90	91	92	93	94	95	compound annual growth rate
Animation	39	28	30	19	19	21	-12%

Data source: Digital Content Industry Promotion and Development, Industrial Development Bureau, Ministry of Economic Affairs (2006), Digital Content Industry in Taiwan 2006

The animation output had an upturn from 2007. In 2009, the domestic-made animation output was approximately 40 billion TWD which grew 37.9% compared to 2008. The growth was due to animation application by enterprises and television and movie production. (Industrial Development Bureau, Ministry of Economic Affairs 2009) The majority of the global

animation market is from television which makes up more than 60%. The situation is the same here in Taiwan. According to the Table 1 that indicates the percentage of domestic-made animation is 79.2% which means that, Taiwan animation industry was turning into domestic-made orientation instead of processing for others in the past.



Figure 1. Taiwan animation output change in recent years

Data source: Development of Taiwan Animation Industry in Present, Shu-Ting Liao (2008)

2. Trends and Prospect

This study is mainly based on Digital Content Industry in Taiwan 2009 and compiling related reports and researches. The trends and prospects of computer animation are listed below.

(1) Product Authorization and Broadening the Profit Sources

The supply chain in Taiwan animation industry is not quite complete. It remains focusing on center-section production. The animation profit chiefly comes from product authorization therefore animation role settings and capabilities of storytelling will be the substantial keys for developing cross-platform products and performing products authorizations.

(2) Multiple Platform Media Players

Could computing has become the media basic for next generation. With the connections between central super servers and wireless broadband, making broadcasting contents to various platforms possible, These platforms could be network TV (e.g. IPTV), mobile phones, walkman (e.g. iPod) and so forth. Producing compatible content for

multiple-platforms will be one significant developing trend.

(3) The Fashion that 3D Movies Have Brought

In 2009, the box office record-breaking 3D movie, Avatar soon led development in 3D films. Not only 3D movies, but also 3D television intends to bring families stereoscopic impacts. Obviously, exploring and developing stereoscopic pictures will definitely be the craze in entertainment economy.

2.2 The Game Production Procedure and Development Team

Game developments were divided into 5 phases which are Concept Phase, Preproduction Phase, Production Phase, Quality Assurance Phase and Maintenance in the book, Game Design Workshop (Fullerton. T, 2007). The procedures in game development are repeating and continuous revision. In the early phase of developing, there would be more flexible space to alter. While investing more funds, manpower and time, the less flexibility will be when it comes to finishing phase.

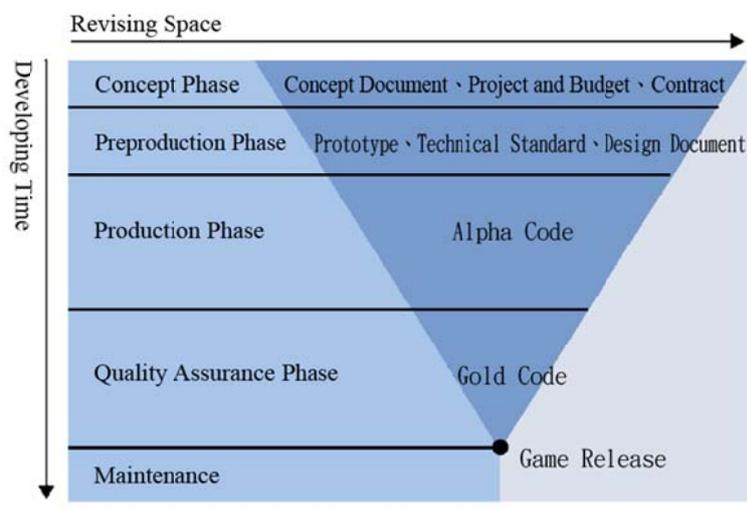


Figure 2. The Game Development Phase

Data source: Game Design Workshop, a Playcentric Approach to Creating Innovative Games. Fullerton. T. (2007)

In accordance with procedure from Institute for Information Industry, Yu-Sheng Lin and Yun-Chu Huang divided development procedures of game

software into five stages. They are Game Proposal Stage, Case Study and Project Stage, Production and Development Stage, Test and Postproduction Stage and

Release and Review which are displayed in Figure 3.

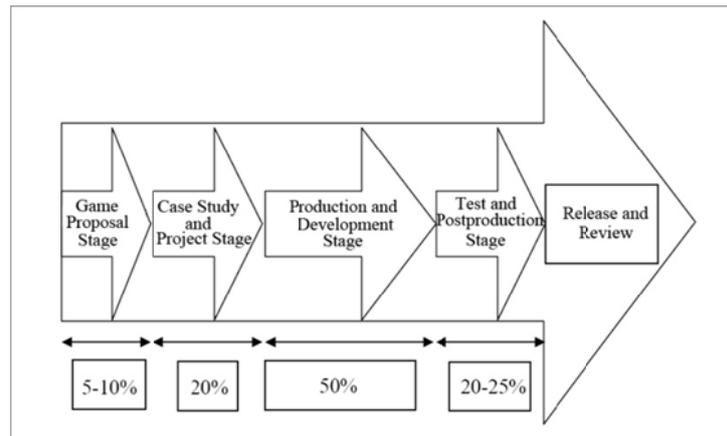


Figure 3. The Development Procedure of Game Software

Data source: Prospects in Taiwan Computer Games Market 2005~2006, Yu-Sheng Lin (2005)

After studying and compiling the five stages of game production procedures divided by Fullerton and Yu-Sheng Lin, we found similarities in each working stages. Our study mainly emphasizes Yu-Sheng Lin's game software procedure and secondly Fullerton's game development stages so as to conform to game production procedures in Taiwan. The stages points are listed as follows.

1. Game Proposal Stage

Concept Phase is started with ideas about games. "Market State," "Target Consumers," and "Game Market Positioning" decide the proposal feasibility and to write concept documents for game content, features and "gameplay." Also, to estimate manpower allocation, funds and time to make project plans. The key points in proposal stage are "marketability," "feasibility," and "gameplay."

2. Case Study and Project Stage

Under this phase there are earlier, middle and later stage. The earlier stage is collecting related information, writing and producing related design documents. As to the middle stage, game developers produce a simple and playable game version called "Prototype" in a very short time, in order to comprehend related techniques they need so as to verify the game concept. The later stage is to finish proposals, confirm working items and time

management, as well as to arrange manpower allocation. The key factor of continuing to develop the game or not is believed to be this stage.

3. Production and Development Stage

After preproduction stage, the long production stage will begin. Game developing companies start to invest a great deal of resources to produce games. The "design standard documents" in the previous stage are carried out here. The final goal of this stage is to make Alpha which means all the content in the games are completed but hasn't been "de-bug" and that is the only difference between Alpha and final product.

4. Test and Postproduction Stage

A lot of deliberate tests, inner tests and outer tests will be applied to Alpha. On the inner test, there will be specialized game testers repeatedly test the game details, find bugs, write test reports in order to let developers to "de-bug." The outer test is to test game stability which is carried out by different players or developers. Especially it needs a number of outer players to test on massive multiplayer on line games to make sure that there won't be any serious server crash while officially running.

5. Release and Review

There will still be partial bugs after the game is released. Game companies remain make update so that players can download the latest files. Around two months after

releasing the game, the sale usually slow down gradually and meanwhile developers will have a discussion about the tool programs and users' feedback so as to enhance next games development and to accord with the market demand.

2.2.2 The Game Development Team

Fullerton (2007) pointed out that a game development team contains producer, assistant producer, game designers, programmers, visual artists, quality assurance and specialized media. The organization of a development team is shown in Figure 4.

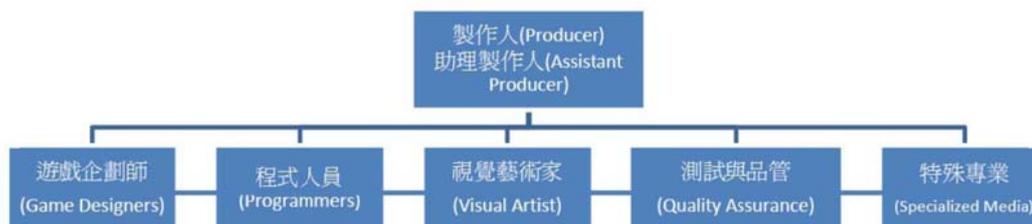


Figure 4. The Game Development Team

Data source: Game Design Workshop, a Playcentric Approach to Creating Innovative Games. Fullerton, T. (2007)

1. Producer and Assistant Producer

A producer and assistant producer are in charge of team leading and team management, connection between game publishers and the team, production budget, tracking and planning applications to resources, time management in production procedures and also inspiring the crew also are responsible for related problems solving.

2. Game Designers

A game designer is responsible for inspiring originalities, creating game prototypes, game testing and modifying prototypes, writing game concept and design documents, also has to renew ideas little by little and to propose ideas based on users' point of view.

3. Programmers

Programmers have to draft technical specifications, produce all the techniques when making the game that are software prototypes, software tools, game modules and engines, data structures, communication management and etc. Also they need to record program codes and process game "de-bug" with quality assurance personnel.

4. Visual Artists

Visual artists are in charge of 2D and 3D visual art which includes design and production for the roles, scenes and

things in the game, interface design and production, animation and eye catches.

5. Test and Quality Assurance

6. Specialized Media

The definition of the term "specialized media" usually means those who are specialized in screenwriting, sound effects, music composition, martial art or dialogue direction. There are various kinds of specialists also the employment depends on different needs of the games, therefore the duration is usually not very long and they are generally called "specialized media."

2.3 The Game Production Procedure and Development Team

2.3.1 Computer Animation Production Procedure

There are three stages of a computer animation production which are preproduction, production and postproduction. The summary of each stage, in compliance with Pocock and Rosebush (2002), is described as below.

1. Preproduction

Preproduction is the stage of the animation development and design. It contains the creation of animation concept, writing concept documents, development of role

modeling, scene design, story script production, writing stories or plays, budgeting, allocation of time and work and contract signing. Production stage comes after all these procedures.

2. Production

It takes the most time in this stage. Besides the animation clips integrated with real scenes that need to be shot in advance, regular tasks are sound recording, animatic production, modeling, action adjustment, lighting, low alignment diagram, alignment diagram and quality control.

3. Postproduction

In the last stage of production, a version of low

alignment diagram will be edited in advance. When both of the client and the production team agree that any revision is no need, it comes to the final stage. All the products will be integrated on this stage. The products contain incidental music which had been recorded in advance, dubbing, pictures, and that last, list of the crew. All of these will be output into a completed animation. Figure 5 explains the flow chart of animation drawing which is in compliance with interview results with domestic animation companies by Research and Survey of Talents Supply in Digital Video Design Industry. (2004)

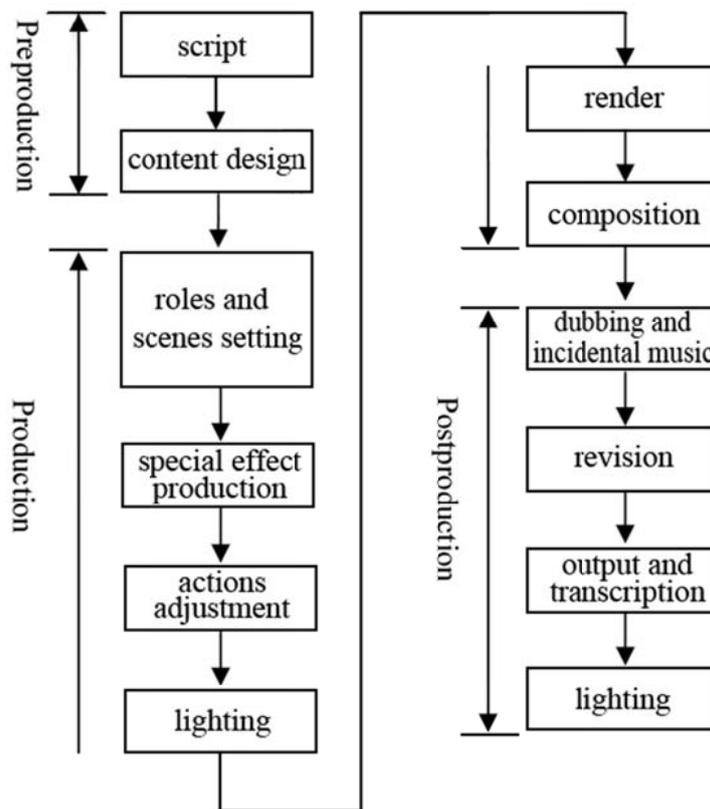


Figure 5. Animation Production Procedure

Data source: Research and Survey of Talents Supply in Digital Video Design Industry. (2004)

2.3.2 Animation Development Team

The introduction of animation production division of labor, based on Pocock & Rosebush (2002) is as follows.

1. Producer

The most significant member in the animation

production team must be the producer who commands funds resources, budgeting, adoption of crew members, schedule arrangement, also he is responsible for functional decomposition based on the play and story scripts. From concept making to animation completion,

the producer supervises all the tasks and procedures.

2. Production Assistants

Production assistants are in charge of assisting the producer with his/her duties.

3. Director

The director has to arrange visual layout and report on the schedule to the producer. There are two definitions of director; the traditional aspect explains that a director is the one who has to take whole-skill training and is in charge of action direction and the one who makes the animation come to life. On the other hand, the definition of a director in modern times is that he/she also has to add imagination concept into animations. In other words, the director undertakes the creativity success in the project.

4. Art Director

The art director's chief duty is to supervise the visual layout which includes the links in each scene, style setting and so forth.

5. 2D Artist

In 2D animation, a 2D artist design roles and scenes based on the script but while producing a 3D animation, the artist is also in charge of texture drawing.

6. Modeler

The modeler's main responsibility is to construct the designed objects, roles and scenes into 3D models.

7. Animator

The animator is in charge of roles' action performance. In 2D animations, animators need to draw a series of

action frames while using 3D software to adjust roles' and cameras' actions in 3D animations.

8. Lighting Artist

In 3D animation production, lighting artists have to undertake the production of roles and scenes lighting, as well as alignment diagram and composition.

3. Methodology and Research Design

3.1 Methodology

Our research focuses on the design specialists that present game and animation industry need from talent on demand aspect. Also the study analyzes division of labor procedure in current industry and discovers the professional techniques that talents need. We referred to related references, made deep interviews, compiled industry background and then processed questionnaires to obtain the completed and objective study results.

3.2 Research Procedure

We processed surveys from digital content industry's "aspects of demand" and compiled current Taiwan digital content industry related references. With deep interviews, the information we obtained indicates the professional techniques that design talents do need. The next stage is carrying out Questionnaire Survey and then collecting quantified data, finding out the specialized skills that design talents should build up. The research procedure is shown in Figure 5.

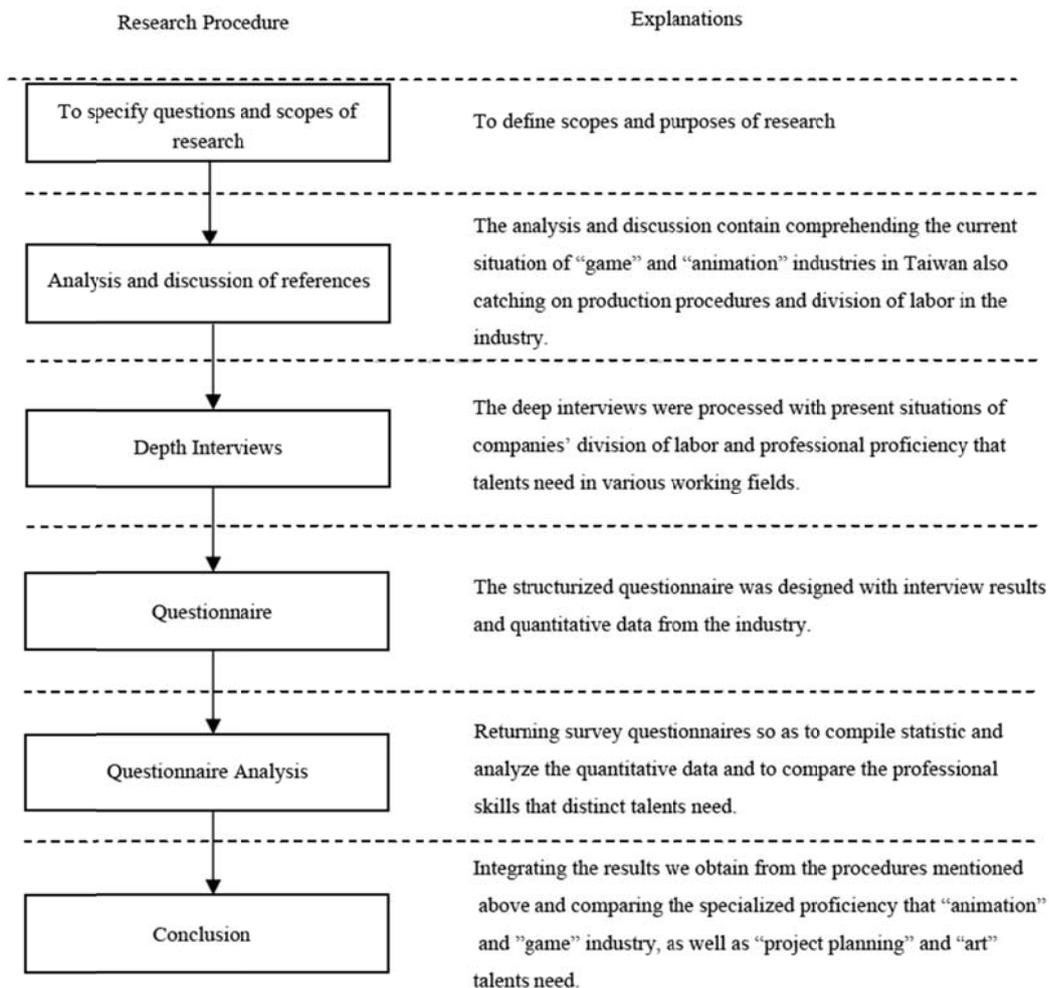


Figure 5. Research Procedure

Data source: compilation of this study.

3.3 Interviewees

The purpose of this study is to comprehend professional skills of games and animation producers so the survey candidates should able to express opinions on our research purpose. Therefore, before selecting the interviewees, the precondition was that, the companies where the interviewees currently work in is continually developing or producing animation productions and have public praise and experience. We respectively chose three typical companies in game industry and in computer animation industry and then processed interviews with suitable candidates recommended by those companies.

1. Digital Games Company

The interview subjects in digital games companies were

from ASTRO Corp., International Games System Co., Ltd. and XPEC Entertainment Inc. ASTRO Corp. is the developer of big gaming machines; International Games System Co., Ltd. is engaged in developing and operating big video games and online games; XPEC Entertainment Inc. is one of the few video game mainframe developers in Taiwan and it is also an art original equipment manufacturer which contracts a great deal of business from overseas. All of these companies are well-experienced in developing and have large-scale operation. Also their developing spheres cover three dimension, big video games, online games and mainframe games.

2. Computer Animation Company

The interview subjects from computer animation

industry are from Pixelframe Visual Technology Corp., CGCG Inc. and SOFA studio. Pixelframe Visual Technology Corp. mainly contracts production of commercial animation. CGCG Inc. is the most typical 3D animation company in Taiwan. It undertakes a number of international professional tasks every year. SOFA studio is chiefly engaged in self-made TV animation production and successfully promotes their products overseas. These three companies respectively represent commercial animation, original equipment manufacturing and self-made TV animation. CGCT Inc. and SOFA studio are animation companies on a larger scale. Though Pixelframe Visual Technology Corp. is relatively smaller, a lot of Taiwan animation companies are on a smaller scale, therefore, it represent the current situation in Taiwan pretty well.

3.4 Interview Outlines

In this study, we applied semi-structured interview which is to frame interview outlines based on the study purpose before processing the interviews. Also we provided the survey candidates the interview outlines in advance in order to make them well prepared. The purpose of making interview outlines is to prompt so it was not necessary to go through the outlines one by one and in outlines order while processing the formal interview on account of making the subjects to express their own experience freely. We would go into details when the interviewees had distinctive reflection on this issue. The interview outlines are as follows.

1. Could you please describe how your company process game/animation development?

- (1) What are the major business activities that your company operates? Self-made production or original equipment manufacturing?
- (2) What are the stages while your company processing game/animation production?
- (3) Please describe the working procedures on each stage.

2. What positions do project planning/art specialists

hold respectively? What do their job descriptions contain?

- (1) What positions do project planning specialists hold and what do their job descriptions contain?
- (2) What positions do art specialists hold and what do their job descriptions contain?

3. What professional proficiency does your company demand project planning and art talents?

- (1) What professional proficiency do project planning talents in different positions should equip?
- (2) What professional proficiency do art talents in different positions should equip?

4. What basic abilities do your company demand new employees?

- (1) What are the sources of new employees?
- (2) In terms of your own experience, what would new employees usually have to improve?
- (3) What job training does your company give to new employees?

3.5 Questionnaire

The questionnaire was designed based on the “game” and “animation” interview results we compiled as above. Our study purpose is to survey what professional proficiency that employees in this industry actually need. Owing to the little discrepancies among the companies, the professional skills that each company need might be different. Therefore we did not sieve out the professional proficiencies until we operated factor analysis and found out the relationships among the proficiencies.

3.5.1 Questionnaire Design

Part one contains personal and company information. It is to comprehend interviewees’ population variables which include the survey candidates’ positions and working durations in this company. The population variables also include the company’s profile, such as the extent of the company’s self-made and original equipment manufacturing, scope of business activities, number of staff and the company’s capital.

The second part is multiple choice questions designed based on interview results. The purpose is to know the professional proficiencies that project planning and art talents in game and computer animation industry should equip. We used structured questions to determine and designed by Likert Scale 5. The format of five-level Likert item is:

1. *Strongly disagree*
2. *Disagree*
3. *Neither agree nor disagree*
4. *Agree*
5. *Strongly agree*

3.5.2 Survey Candidates

We sampled Major Business Directory in Digital Content Industry (Digital Content Industry Promotion Office 2007) and selected our survey candidates in this questionnaire. We then compared related industry seminars, trade shows directories to increase, decrease and revise survey company list.

3.5.3 Survey Methods

3.5.3 The survey is carried out by mailing questionnaires. We sent them in light of company list and the companies passed the questionnaires to project planning/art talents so as to complete the questions. We sent 10 questionnaires to each company; totally 230 copies to 23 game companies and 270 copies to 27 animation companies. The date of mailing was early October in 2009 and the date of returning was November 30th, 2009.

3.6 Data Analysis

After returning the questionnaires, we checked the data and eliminated invalid ones then compiled statistics. The software we used was SPSS (Statistical Product and Service Solutions) 11.5 for windows. The data analysis methods are as follows.

1. **Descriptive Analysis:** to gather statistics of samples' distributions and scores of variables with descriptive analysis.
2. **Factor Analysis:** the professional proficiency in this research was not able to be grouped in advance. Therefore we used factor analysis to classify questions in order to perform follow-up analysis.
3. **One Way ANOVA:** it is used to explore professional proficiencies discrepancies regarding different types of jobs' requirements for talents.
4. **Duncan's New Multiple Range Test:** to further analyze results from ANOVA with group test so as to understand differences among various specialists' needs regarding professional abilities.

3.6.1 Questionnaire Analysis of Digital Games Industry

In this study we surveyed design specialists in digital content industry through questionnaires. We obtained the results via statistical analysis. Table 2 indicates the compilation we summed up regarding professional proficiencies that design specialists in digital game industry need and also we proposed explanations and analysis.

Table 2: comparisons of design specialists in digital game industry

communication skill	creativity	passion for video games and understanding	project development skill	visual development	aesthetic sensibilities and drafting skill	art techniques and knowledge	sensitivity of space	animation performance skill	software operation skill	programming skill
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	g of produc tion proced ure									
producers	⊙	⊙	⊙	⊙	⊙	○	○	○		
art directors	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	○
project planners	⊙	⊙	⊙	⊙	⊙	○	○	○		
2D artists	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	
3D character artists	⊙	⊙	⊙	⊙	⊙	⊙	○	○		
3D scene artists	⊙	⊙	⊙	⊙	⊙	⊙	○	○		
animators	⊙	⊙	⊙	○	⊙	⊙	○	○		
special effects artists	⊙	⊙	⊙	⊙	⊙	○	○	○		
Technical Artist	⊙	⊙	⊙	○	○	○	○	○	⊙	

⊙ represents importance ○ represents secondary importance)

3.6.2 Survey Analysis of Computer Animation Industry

In this study, we surveyed design specialists in computer animation industry through questionnaires. We obtained the results via statistical analysis. Table 3 indicates the compilation we summed up regarding professional

proficiencies that design specialists in computer animation industry need and also we proposed explanations and analysis. On account of not enough data collection of scrip designers, riggers and special effects artists, we were merely able to presume based on interviews.

Table 3: comparisons of design specialists in computer animation industry

creation	communi cation manage ment	project and story develop ment skill	visual develop ment	esthetic sensibilit ies and drafting skill	art techniqu es and knowled ge	animatio n performa nce skill	software operation skill	progra m sill
producers	⊙	⊙	⊙	⊙	⊙	○	⊙	○
directors	⊙	⊙	⊙	⊙	⊙	○	⊙	○
art directors	⊙	⊙	⊙	⊙	⊙	⊙	⊙	○
screenwriters	⊙			⊙		⊙		
scrip designers	⊙	⊙	⊙	⊙	⊙	⊙	⊙	
2D artists	⊙	⊙	⊙	⊙	⊙	⊙	⊙	
modelers	⊙	⊙	○	⊙	⊙	○	○	○
Rigger	⊙	⊙	○	○	⊙	⊙	○	
lighting artists	⊙	⊙	○	⊙	○	○	○	○
animators	⊙	⊙	○	○	○	○	⊙	○

special effects artists	◎	◎	◎	○	○
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◎ represents importance ○ represents secondary importance)

4. Conclusion and Suggestion

The purpose of this study is to explore the ability requirements for project planning and art talents in digital game and computer animation industry. In order to achieve the research purpose, we obtained the data regarding professional skills that project planning and art talents need via references, depth interviews with industries and questionnaires. This chapter combined the research results in game and animation. Brief results are described as below.

4.1 Conclusion

4.1.1 The Need of Talents in Industry

Both of game industry and animation industry need considerable division of labor and also need talents from various fields to cooperate together. The constructions of division of labor are pretty similar. The talents can be roughly divided into supervision specialists, preproduction design specialists and production development specialists.

1. Supervision Specialists

In a project development, there must be a leading specialist in charge of supervise the quality of productions and production schedule. There might be producers, art directors and etc. in game industry. As for animation industry, there are producers, directors and art directors. Art directors in these two industries are very similar. They are in charge of drawing up the pictures styles and arranging art designers' work schedule.

2. Preproduction Design Specialists

What preproduction design specialists do may not have direct correlation with end products. But via creativities, words, images or other media they can express ideas to developers working on this project.

3. Production Development Specialists

Production development specialists, on the contrary,

have the most correlation with end products. They are responsible for turning preproduction designers' ideas into end products. On this stage, the distribution of game and animation production specialists is a bit different. The division of labor depends on modeling, framework setup, texture drawing, animation production, special effects, and lighting. But division of labor of game developers is in the light of 3D character art, 3D scene art, special effects art and role actions.

4. Discrepancies of Needs Between Self-made and OEM

In comparison of self-made and OEM, there are usually supervision specialists, preproduction design specialists and production development specialists on self-made side but sometimes with different project size, the self-made side outsource partial production development. On OEM side, it is frequent to outsource video games' art design. If engaging in art design OEM, then preproduction is not necessary, just to produce by clients' standards. There are two ways of animation original equipment manufacturing. One is that clients provide preproduction content and the company performs animation production directly. This method is usually used on large animation. The other mean is finishing all productions including preproduction projects. It is mostly applied on commercial animations' OEM.

4.1.2 Professional Proficiency

The study compiled the whole survey results from basic capabilities, specialized capabilities and abilities of cross-field integration.

1. Basic Capabilities

The passion for the job, being creative and communication skills are the three significant and basic abilities to join animation or game industry. Being creative is the essence of animation and video games, passion is the key point of work duration and enhancing skills. And good communication skill is about the

harmony of team work and efficiency of performing work.

2. Specialized Capabilities

Specialized capabilities mean professional skills that one need to finish the job. In current situation, both of video game industry and animation industry, the ratio of self-made is increasing. The HD generation in IT industry is facing increasing competitions, production scales will be larger and it needs more personnel to participate then it will be gradually moving towards fine division of labor. How to build up a single professional skill profoundly appears to be very important.

3. Abilities of Cross-field Integration

Those who equip professional capabilities, after going through industry training for a while, will possess sufficient practical experience. In addition, those who have considerable contact and understanding in other fields would be able to become cross-field integration talents, such as producers or art directors in game industry. Directors, production directors and art directors in animation industry are classified as cross-field integration talents.

4.1.3 Talents Supply Gap

Taiwan digital content training units have been sprung up like mushrooms over the past decade. The government established related departments in virtually 30 universities and nearly a hundred of private information training units in a very short time. Although the government and educational institutions tried hard to exert, digital content industries did not seem to show respect for it. They advised the government about lacking of professional talents instead. (Ya-ling Hung, 2007) It looks like that numerous training policies did not solve problems of talent supply gap. Obviously, the problem of talent supply gap in Taiwan digital content industry is not about “quantity,” it was “quality.” Our research compiled the results and further discussed about the problems of talent supply gap from mindset side and professional proficiencies side.

1. Gap of Mindset

(1) The Determination to Pursue Excellence

“Game industry is a crazy industry. Why is it crazy? Because you want something to be good, then it could not be any worse.” This word not only reflects the game industry, but also highlights one distinguishing feature in the whole digital content industry that is to pursue excellence. And this distinguishing feature not only reflects end products, but the personnel in this industry. The determination to be superb makes their creativities and professional techniques better. As for those not in the industry will not be able to feel the essence to pursue excellence, therefore there will be gap on mindset, enthusiasm for learning and the requirement of industries.

(2) Business Thinking Which to Fit in with Market

Animation and game products can create value is mostly because of being accepted by the market. Crew in this industry should possess this kind of idea also follow this logic while creating and designing. New employees to the industry usually lack of business thinking which to fit in with the market, consequently, they often have difficulties to meet the industry’s needs.

2. Professional Skills Gap

Professional skill gaps reflect the problem of talent supply gap directly. When one’s professional techniques are not strong enough, he/she won’t be able to meet industries’ needs. When a new employee joins the industry, he/she often needs to go through 2 to 3 years of training so his/her techniques can achieve |professional quality.” How to improve one’s capabilities to meet the industry’s needs becomes the key point to reduce talent supply gap.

4.1 Suggestions

Who the industry actually need are those who can really “work”, not students that need further education. The solution is to improve talents’ quality. The best way to do it is to let students directly perform practical training. For one thing, students can experience attitudes in work

place. For another, with learning from work, new employees can acquire the most efficient learning methods from work. Accumulating one's technique experiences, application of various tools software and with practical drill and training, one can accumulate his/her inspirations, independent thinking and team communication and coordination abilities. (Ming-hui Huang, 2007) We suggest Industry, Official and University to establish cooperation platforms and create more specialists' internship opportunities in order to solve talents supply gap problem. The specific recommendations are as follows.

1. On official side: provide platforms establishment policies, funds of performance also industry and university internship subsidy.
2. On training unit side: besides giving students knowledge and correct concept, also help students find the key points to improve their professional skills in core fields. Furthermore, through cooperation platforms to match students and industries, understand industries' needs and changes and quickly apply to education.
3. On industry side: offer internship opportunities. Through industry internships, students can get to know the workplace environment and build up professional skills and accumulate production experience by way of practice.

When talents quality are enhanced, next step is to integrate industry, official and university resources through this platform, and to develop large international projects, increase output, expand enterprise talents need and build good positive circulations.

4.2.1 Suggestions for Follow-up Development

1. Research Subjects

Our research merely aimed at the demand side in Taiwan's industries to perform talents' professional proficiencies survey and research. In Taiwan, there are more than 30 universities offer digital content related

departments. In addition, the government and some private education industries train a good deal of talents in digital content industry each year. Researchers who would like to engage in related follow-up researches in the future can start with talent supply side or to perform comparisons between supply side and demand side, so as to discuss talent training and learning guidance.

2. Research Methods

This research was performed with depth interview and quantitative questionnaires but owing to the limited time and funds, the number of returning questionnaires were finite. We were unable to survey all of the professional proficiencies that each position requires. Moreover on account of too few returning questionnaires, the study results couldn't exhibit the discrepancies among various items of business regarding talents' professional skills. Researchers can make some further studies in this section.

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