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Cultural Industries and Sustainable Development

Edited by
Rungtai Lin, I-Ying Chiang and Jun Wu

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Preface to "Cultural Industries and Sustainable Development"

In response to the pandemic, many activities in human society have had to change, which has allowed us to re-examine past ways of getting along with the world. The concept of sustainable development, whether considered at a theoretical level or in the promotion of practical applications, still requires further efforts from us. After all, design and cultural creativity will eventually be implemented into specific designs. The complexity of the design itself requires careful consideration in all aspects. In the field of engineering in particular, how can we make designs more in line with human nature? How can we implement the spirit and concept of sustainable development in the process of R&D? This requires mutual cooperation between designers, engineers, and companies. Meanwhile, how to make consumers more rational and encourage them to realize the necessity and urgency of sustainable development through design and creativity is also worthy of further consideration. In the field of cultural industry, it is also worth thinking about how to strike a balance between "design thinking" and "design decision" in order to meet the vision of sustainable development. This Special Issue is focused on discussing the development, application, potential, and boundary of cultural industries, as well as creative practices, from the perspective of sustainable development.

Rungtai Lin, I-Ying Chiang, and Jun Wu
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Editorial

Sustainability | Special Issue: Cultural Industries and Sustainable Development

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1. The Origin and Core Issues of This Special Issue

In response to the pandemic, many activities in human society have had to change, which has allowed us to re-examine past ways of getting along with the world. The concept of sustainable development, whether considered at the theoretical level or in the promotion of practical applications, still requires further efforts from us. After all, design and cultural creativity will eventually be implemented into specific designs. The complexity of the design itself requires careful consideration in all aspects. In the field of engineering in particular, how can we make designs more in line with human nature? How can we implement the spirit and concept of sustainable development in the process of R&D? This requires mutual cooperation between designers, engineers, and companies. Meanwhile, how to make consumers more rational and encourage them to realize the necessity and urgency of sustainable development through design and creativity is also worthy of further consideration. In the field of cultural industry, it is also worth thinking about how to strike a balance between "design thinking" and "design decision" in order to meet the vision of sustainable development. This Special Issue is focused on discussing the development, application, potential, and boundary of cultural industries, as well as creative practices, from the perspective of sustainable development. Thus, theoretical research via scrupulous literature reviews in various fields of design, and empirical studies of significant design cases are welcome.

2. The Goal and Topics of This Special Issue

The concept of sustainable development refers to four distinct areas—human, social, economic, and environmental—known as the four pillars of sustainability. The concept of sustainable development appeared for the first time in 1987 with the publication of the Brundtland Report, which warned of the negative environmental consequences of economic growth and globalization and tried to find possible solutions to the problems caused by industrialization and population growth. Whether considered at the theoretical level or in the promotion of practical applications, greater efforts are still needed from us.

Cultural industries are a challenge for the future of culture. This field includes four main topics, namely features, domination, individualization, and the characterization of the culture industry itself. The purpose of cultural industries is important for ensuring the continued development of society and is at the heart of a creative economy for generating considerable economic wealth. Cultural industries foster the development of new products and the redesign of traditional products, offering a profound knowledge basis upon which future research and innovation can build.

In essence, industry and sustainability run in opposite directions, so how to connect "Cultural Industries and Sustainable Development" becomes a challenging issue. Therefore, this Special Issue, entitled "Cultural Industries and Sustainable Development" [1], is

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focused on discussing the development, application, potential, and boundaries of cultural industries to create sustainable development from the perspective of "design thinking". Thus, theoretical research via scrupulous literature reviews in various areas of design, and empirical studies of significant design cases are welcome.

Potential topics include, but are not limited to:

- Frameworks for cultural industries and sustainable development that include creativity and critical thinking;
- Theory and practice within cultural industries and sustainable development approaches;
- Cultural industries and sustainable development of cross-disciplines;
- Design implementation for sustainable development;
- The study of creative design strategy;
- Designs for society;
- Special design case studies.

3. Results and Discussion

Design and cultural creativity will eventually be implemented into specific designs. The complexity of the design itself requires careful consideration in all aspects and especially in the field of engineering. How can we make designs more in line with human nature? How can we implement the spirit and concept of sustainable development in the cultural industry? This all requires mutual cooperation between designers, engineers, and companies. Meanwhile, how to make consumers realize the necessity and urgency of sustainable development through cultural industries also needs to be considered. We must consider how the trade-off between "culture" and "industry" can meet the vision of sustainable development.

The articles in this Special Issue can be divided into four categories, which will be discussed in detail below.

3.1. Study of Tourism in Relation to Sustainability

The COVID-19 pandemic has been causing considerable difficulties for the global travel industry since the end of 2019. Tourism has recovered to a certain extent in some countries or regions as the pandemic gradually recedes. In spite of this, it may take some time before tourism returns to its normal state. Because of the COVID-19 pandemic, the tourism industry has also taken the opportunity to reflect on past models that could have potential problems, which has prompted the industry to reform itself. Even though this is not unexpected, the tourism sector has also been given the opportunity to rethink its strategy. As tourism develops in the future, it will pay more attention to its sustainability and positive interaction with tourists. There are some countries and regions that have enacted policies relating to this issue. As part of the effort to create a sustainable tourism industry, many new concepts have been proposed.

3.1.1. Contribution 2: Sustainable Development Assessment of Cultural and Creative Industries in Casino Cities: A Case Study of Macao

Consequently, contribution 2 focuses on the service innovation based on the Macao government's proposal of eight cultural and creative industries (CCIs) policies [2]. This study organized an industrial feasibility analysis for these eight CCIs. Thus, this study adopted the concept of creative industries to propose an approach for positioning these eight CCIs to choose existing industries in Macao, such as the exhibition, gambling, and cultural tourism industries, which are likely to promote CCIs. It is suggested that the performing arts, design, and visual arts industries should be prioritized, and the heritage management and digital media industries are advised to be developed from local culture to the global market.

3.1.2. Contribution 7: Eliciting Brand Loyalty with Elements of Customer Experience: A Case Study on the Creative Life Industry

The Creative Life Industry (CLI) is an experiential industry in Taiwan. Contribution 7 aims to show how designing valuable realms of experience can generate brand loyalty in customers, and focuses on how the CLI is experienced [3]. The findings indicate that many elements play a role within the realms of experience in CLI businesses. These include cultural experience interest, relaxing and entertaining programs, guided tours with educational and aesthetic meaning, living aesthetic program relatability, architectural style and aesthetics, fashionable product design, the differences between living design and routine life, and the uniqueness of service facilities. Theoretical and practical implications are provided for CLI businesses and researchers. Moreover, elements of escapist and aesthetic experiences have more significant effects on brand loyalty for sustainable development than other types of experience.

3.1.3. Contribution 8: How the Experience Designs of Sustainable Festive Events Affect Cultural Emotion, Travel Motivation, and Behavioral Intention

Festivals play an important role in local culture, as discussed in contribution 8 [4]. They not only attract a large number of tourists, but also are one of the most direct ways to promote local culture. Based on tourism, this study aims to explore how festival experiences affect cultural feelings, travel motivations, and behavioral intentions. Moreover, cultural emotion is a critical component in designing influential festive event experiences that evoke travel motivation and behavioral intention. A combination of virtual and in-person experiences or personal and group exchanges would be ideal. Organizers should consider including emotional elements in their festive events in addition to originality. The inclusion of cultural elements can also foster "shared" experiences between locals and visitors, diversifying urban landscapes and strengthening community interaction. Organizers can plan festive events that align with consumers' expectations, distinguish festive events from other community events, and add uniqueness and originality to their events to foster culture and sustainability.

3.2. Study of Cross-Culture Design in Relation to Sustainability

Recently, cross-border thinking has gradually become mainstream, and cross-cultural design has achieved many successful results. Modern design has the opportunity to achieve true sustainability through this approach. It is also possible for the design to be enhanced by the interweaving and collision of different cultures.

3.2.1. Contribution 4: Exploring Indigenous Craft Materials and Sustainable Design—A Case Study Based on Taiwan Kavalan Banana Fibre

With regard to tangible heritage, contribution 4 focuses on the use of banana fibers in the craft traditions of the Kavalan people of Taiwan, and research-through-design concepts were applied to the creative study of materials that are essential to ecological sustainability and cultural heritage [5]. The goal was to gain a holistic understanding of materials and leverage the participants' expertise in determining which steps in the methods could be improved. Through the experiments, the findings regarding the examined materials and material trials for developing a material trial loop based on material-driven design can be combined with the unique insights and technical expertise of designers, being used alongside contemporary technical and digital aids to effectively support the continued development of innovative craft designs.

3.2.2. Contribution 5: The Relationship between Form and Ritual in Cultural Sustainability

Based on cultural heritage, tourism has become a timely issue in cultural industries. Contribution 5 used local culture to enhance the attraction and competitive advantage of national or regional tourism [6]. This study proposes a framework for exploring form and ritual and discusses the cultural industry from the "Hi-tech" of form to the "Hi-touch" of ritual through case studies. Three cases were analyzed and studied regarding how to

improve local tourism development through the interaction between form and ritual. The study showed that this approach can integrate sustainable development into intangible cultural heritage tourism and can be further verified in other countries and regions. Hence, as a vital tourism resource, intangible cultural heritage can activate the in-depth experience of tourists for sustainable development.

3.2.3. Contribution 9: How Design Technology Improves the Sustainability of Intangible Cultural Heritage Products: A Practical Study on Bamboo Basketry Craft

In contribution 9, the authors argue that the lack of labor between design and manufacturing blocked the development of the bamboo basketry craft industry [7]. Therefore, based on the innovation theory, the authors' team studied the design technology of bamboo basketry, and developed a series of tools to aid the bamboo basketry industry. The technology enables designers to quickly design and express weaving structures with full detail in digital models, rather than needing to make samples. The approach shows that the technology greatly improved the designers' interest and confidence in conducting the innovative work. Although a systematic approach is lacking in this article, the authors argue that the practice shows that the sustainability of intangible cultural heritage products and the sustainability of the industry are closely related, and solving the latter is helpful to the former. The results presented in contribution 9 create an interface for looking at the way technology innovation design crosses over cultures, as well as illustrating the interwoven experience of craft and cultural industry in the innovation design process for sustainable development.

3.3. Study of Heritage in Relation to Sustainability

In relation to the previous topic, countries throughout the world are increasingly recognizing the importance of cultural heritage. As well as tangible items, such as artwork, crafts, and landscapes, cultural heritage consists of intangible items, such as family customs and beliefs. In this section, three articles are presented that deal with the topics listed above. It is essential that more attention be given to the preservation and transmission of cultural heritage. New ideas and cultures can also be created from the valuable legacies of the past.

3.3.1. Contribution 3: Inheritance of Traditional Family Values: A Comparative Study of Family Ancestral Shrines and Related Paintings of Lee Family

Considering the intangible cultural heritage, contribution 3 proposes family values to remind us that traditions within families are an often-unseen force that have a profound effect on people [8]. In this article, first, the meaning and value of family traditional inheritance were explored, alongside potential manifestations. Then, a conceptual framework is proposed, and the forms used to express "home" and "family traditions" are then further examined, considering the different media in the transmission of family traditions. Finally, the family memorial hall named "Qiyun Residence" was combined with a series of paintings called "Home Sweet Home", created by members of the Lee family, to analyze and interpret family traditions. The importance of family values cannot be overstated, but they must be appropriately expressed. The examples presented in this article show how "tradition" can be transferred to "modernity" for cultural sustainability.

3.3.2. Contribution 6: K-Pop's Global Success and Its Innovative Production System

In general, the clothing, pop music, film and video, animation, and publishing industries are not so beneficial for sustainable development. Contribution 6 focuses on the global music market, which has witnessed the rapid rise of Korean pop music (K-pop) [9]. Based on a historical analysis of Korea's music industry, the study contends that the innovative production system of Korea's music business has played a significant role in facilitating K-pop's global success. To prove the argument, this study critically reviews the existing literature to present debates on how value is created in the music industry; cooperative and competitive interactions between firms within the music industry; and changes in the music industry's competitive environment. This study determined that limited atten-

tion has been paid to the key players in the cultural industry and music businesses for sustainable development.

3.3.3. Contribution 11: A Pilot Study on Reproduction and Sustainable Development under the Promotion of Crafts: Taking Weaving in Taiwan as an Example

Last but not the least, contribution 11 analyzes the human touch of crafts and their value from the perspective of humanity and technology, and the attempts to make them reappear elegant and sustainably developed [10]. A conceptual model was proposed to interpret the communication and cognition between craftsmen and the general public. The feedback of three Taiwanese craftsmen in the field of weaving was used as the basis for follow-up discussion. As more and more people begin to pay attention to craftsmanship, how to make it sustainable is becoming more and more important. The article addresses three important aspects that need to be worked on in the future: emphasizing the cultivation of craftsmanship education; keeping pace with the times so that handicrafts continue to transform; and letting the crafts better reflect the true meaning of life. Future studies will address the limitations of such subjective opinions.

3.4. Study of Local Culture in Relation to Sustainability

Various cultures are merged in Taiwan, which is the subject of the last two articles. It is important to study the cultural sustainability of a particular region, whether it is the culture of indigenous peoples or the evolution of modern design. In most cases, people are more concerned with their own location's cultural characteristics and the impact they have on their lives.

3.4.1. Contribution 1: Sustainable Development in Local Culture Industries: A Case Study of Taiwan Aboriginal Communities

Taiwan's indigenous communities have an abundance of unique cultures. Their service industries, with their local cultures, have opened up distinct opportunities for sustainable development. However, the problem is how to shift from "local feature" to "global market". The traditional emphasis on craftsmanship and design is shifting to a new focus on the service industries and experimental design, which is not limited to the design of tangible products. Design concepts are now being applied to service industries that span several fields and are also being used to come up with systematic solutions for real-life problems. Therefore, based on research, contribution 1 proposes a model of experience design for use in aboriginal culture revitalization [11]. Three different cases show how to apply the framework, from experience design to local revitalization. The results show that the model can integrate the principles of sustainability into service industries, and that it needs to be verified in future studies.

3.4.2. Contribution 10: Empirical Study on Design Trend of Taiwan (1960s–2020s): The Evolution of Theme, Diversity and Sustainability

In this Special Issue, we are happy to see contribution 10 make use of IT, by utilizing the Python program language to apply three algorithms to conduct text exploration based on the evolution of theme, diversity, and sustainability for design journals spanning the 1960s to 2020 [12]. The results show the following: in the 1960s–1980s, the evolution of design trends focused on evaluation strategies, technical practices, foreign cultures, digital design, multiculturalism, and design aesthetics, while in the 1990s it focused on emotional human factors, intelligent technology, and local culture. This indicates that current design needs to be stimulated by external environmental variations. Thus, local culture and intelligent technology are the main driving forces of the current design industry. The article reveals that sustainability was focused on technology, the market, and education during the 1960s–1980s; on the consumers, design education, and eco-design during the 1990s; and on the integration across fields during the 2000s–2020s. The final results show the current and future trends of the academic community, in addition to providing a reference for the study of design history in other areas of the world.

4. Conclusions

With increasing global competition, cultural industry is not merely desirable for a company; rather, it is mandatory. The importance of sustainable development is shown repeatedly in academic studies in all fields. However, there is a lack of a systematic approach that covers cultural industry and sustainable development. In this Special Issue, several approaches are proposed for applying service innovation design to the domain of cultural industries. These new approaches for tourism, culture, and heritage are presented herein to provide designers with a valuable reference for integrating "culture" into successful cross-cultural industries. The purpose of this Special Issue is to encourage "cultural industries" by connecting culture and industry, through which we can synthesize technology, humanity, and cultural creativity, thus achieving the aim of promoting "sustainable development" to the public.

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Article

A Pilot Study on Reproduction and Sustainable Development under the Promotion of Crafts: Taking Weaving in Taiwan as an Example

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Abstract: Taiwan's crafts have a long history and distinctive characteristics. Crafting faces many challenges, such as the lack of new involvement and how to achieve sustainable development. This study takes Taiwanese weaving as an example. Employing a qualitative research method, this study focuses on measures that will help achieve sustainable development. After reviewing the humanistic approaches toward and values of craftsmanship, a conceptual model of communication and cognition between craftsmen and the public is constructed using communication theory. Data were collected using semi-structured interviews with three craftsmen in the field of weaving. The findings indicate that the tenacity and connotations of Taiwanese crafts have been well protected. The question of how to make it sustainable has become increasingly more important. Three features were identified that may be important considerations to make for future development efforts: (1) emphasizing the cultivation of craftsmanship education; (2) keeping pace with the times so that handicrafts continue to transform; and (3) letting the crafts better reflect the true meaning of life. Future studies will further validate the results of this study, avoiding too few respondents or the limitations of subjective opinions.

Keywords: Taiwanese crafts; weaving; craftsman's spirit; promotion and management; tangible and intangible heritage; sustainable development

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1. Introduction

1.1. Background and Motivation

The emergence of craftwork can be roughly traced back to primitive societies [1]. It is evident that many elements of culture are integrated into these crafts, whether it is the production process or their appearance (such as shape, color, or ornaments, etc.). We believe that crafts have unique characteristics that are not comparable to the mass-produced products of the 20th Century. Most crafts continue to be manufactured by hand, which is undoubtedly what makes them spiritual in nature. Furthermore, handicraft materials are sourced from nature, and they serve as a bridge between craftsmen and nature. Crafts of exceptional quality are also a true representation of a simple and unpretentious life. Culture plays an important role in the field of craft; through a variety of exquisite crafts, culture is promoted and maintained. Indeed, craftspeople play significant and important role.

However, people's knowledge of crafts is still very limited, and they may be more familiar with mass-produced industrial products. Due to the disconnection or loss of craft skills, traditional crafts, which have been practiced for thousands of years, are facing a number of dilemmas today. Therefore, it may be worthwhile to consider the following question: What can be done to revive traditional crafts in the fast-paced and high-speed modern era, and how can they be made more sustainable? Considering the accumulation of research teams [2–4], we used Taiwanese handicrafts as an entry point to explore this

topic. In order to better carry out the analysis, based on the data and objective conditions obtained, our research focused on the field of bamboo weaving technology.

1.2. A Brief Review of Taiwanese Crafts

Modern design has a long history. Whether it originated in the United Kingdom and Continental Europe or later in the United States, Japan, and South Korea in the Far East, there are individuals who strive to protect, preserve, and promote traditional craftwork of the region. Examples include the Arts and Crafts Movement initiated by William Morris (1834~1896) in the United Kingdom, and *mingei* by the Japanese craftsman Yanagi Sōetsu (1889~1961), and how it impacted later generations [5–8]. The Nordic design emphasis on combining traditional craftsmanship with modern design works by appealing to the philosophy of "coexist and prosper with nature" [9,10]. A major influence of the Bauhaus was its attitude towards crafts, which was profound and far-reaching [11–13].

Culture has been described as "the way of life of the entire society" [14,15]. Lin [2] points out that culture generally refers to patterns of human activity and the symbolic structures that give such activity significance. What's more, culture is a lifestyle, and its formation gives birth to a taste of life through the life propositions of a group of people, and then forms a new "lifestyle" after being recognized by more and more people [16]. Taiwan is one of the models of multicultural integration. Over time, this has created a unique cultural identity in Taiwan, which is also reflected in various crafts.

There is no doubt that traditional Chinese arts and crafts are very much alive and well in Taiwan. Taiwan is a multicultural blend of traditional Chinese culture with significant East Asian influences, including Japanese, and such Western influences as American, Spanish, and Dutch. This blend has allowed Taiwan, over time, to gradually develop its own distinct culture, mostly a variation on Chinese culture from outhern China. Taiwan has a unique advantage in the Chinese region as a result of its multi-cultural integration environment. Additionally, in recent years, the government has paid increasing attention to the protection and promotion of traditional culture, including various crafts [17]. This has meant Taiwan's craft industry has developed in an ideal environment. In Taiwan, when traditional crafts are discussed, they are represented by Yen Shui-long (1903~1997), who is considered the father of Taiwanese crafts (see Figure 1).

We have gained insight into Taiwanese crafts through Shui-long's various articles and books, which also explore the explore of how to further promote craftwork, both in light of the current situation and even how to globally expand it [18,19]. According to his article, *The Necessity of Taiwan's "Craft Industry"*, published in February 1942, Taiwan's craft industry can develop under four favorable conditions [18] (p. 19):

1. Taiwan is endowed with an abundance of natural raw materials.
2. There is a distinct style to Taiwanese crafts (e.g., various patterns or forms).
3. It is evident that the craftsmen and their children possess excellent skills.
4. There was a relatively low wage level at that time. In short, the craftsmen made crafts to sell, and the small amount of income they earned was used to supplement daily expenses.

The above statements describe the state of handicrafts in Taiwan 80 years ago. According to the study, the above statements need to be interpreted at a deeper level, or with different perspectives. Here are the details:

1. Taiwan has an abundance of natural raw materials, which is indeed an advantage, but it also needs to be integrated into the concept of sustainable development, rather than being blindly used.
2. Craftwork is closely related to Taiwan's unique culture. This needs to be explored further.
3. The children of Shui-long's time may already be masters now. Over the years, they have stuck to their fields and innovated further. They are more committed to the conservation and promotion of crafts. These people are highly valuable assets and represent the core values of Taiwanese crafts [20].

4. This point may be controversial, and is one of the issues discussed in this article: In the absence of fair remuneration, it is difficult to encourage young people to engage in traditional crafts by relying solely on so-called 'enthusiasm'. The question of how to formulate a reasonable remuneration, however, is not addressed in this article.

Fortunately, the development of Taiwanese crafts has entered a new era since the turn of the 21st Century. This provides Taiwanese craftworking the opportunity to reproduce its past elegance. On 2 January 2010, the National Taiwan Craft Research and Development Institute (NTCRI) was established, formerly known as the Nantou County Craft Research Class, established in 1954 (Shui-long was the first head of the agency). The NTCRI has always run initiatives for various exhibitions and workshops, giving more people the opportunity to understand the history and advantages of Taiwanese craftsmanship, and to participate in various forms. Furthermore, the NTCRI actively collaborates with various localities to organize workshops, invites craftsmen to make exquisite works on-site, and communicates with students and audiences. It has become evident that Taiwanese crafts have attracted growing interest and attention through academic studies, as well as various promotional activities, and this has become an important foundation for re-innovation and sustainable development.

Figure 1. The cover of *Formosa Industrial Art*, by Yen Shui-long. (**Left**) Cover of the first edition of the book, 1952; (**Right**) cover when it was republished by Yuan-Liou Publishing Company in 2016. (Source: Photographed by this study).

1.3. Purpose

Taiwan's crafts have a long history and distinctive characteristics. Indeed, craftworking faces many challenges, such as the lack of youth and new involvement and how to achieve sustainable development. Over the past few years, Taiwanese crafts have been promoted more frequently as a result of various activities being held. This not only increases the public awareness of Taiwanese crafts, but also affords the public an opportunity to observe and experience them closely.

Based on this context and the core issues mentioned above, and after repeated discussions by the authors, this study will analyze and discuss the following three issues:

- **Handicraft production is relatively complex, it is based on the experience of craftsmen accumulated over many years, and it is difficult to learn over a short time period.**

In short, patience is of the utmost importance in the industry. However, due to the advanced age of many craftsmen and the lack of apprentices, many crafts are in danger of extinction. Thus, how do we promote the craft in order to attract more people to participate in it?

- **Almost all masters and apprentices have passed down many processes of craftsmanship by word of mouth over the years, without leaving detailed text or image records.**

Although modern technology is capable of intervening in the form of digital collections, it is impossible to achieve truly achieve sustainable development solely through the use of technology. It is important to consider this issue in conjunction with the first issue.

- **Traditional crafts must be integrated into daily life.**

Nevertheless, many people do not understand why a craft can be so expensive. There is an asymmetry of information behind this phenomenon: consumers do not understand the effort that craftsmen devote to their work, and the complex, even unique processes involved in the manufacturing of these crafts. Although price is not the sole criterion for measuring a work's quality, for the craft to develop sustainably, economic benefits cannot be overlooked. Moreover, when the audience understands the complexity of the craft and the human touch involved in these crafts, they may not subjectively judge the crafts by the price, and they will also be willing to buy or collect the crafts at a reasonable price, which motivates the craftsman. The emergence of this mutually beneficial situation is also conducive to the sustainable development of crafts.

This study attempts to develop an academic model for enhancing communication between craftsmen and people, in the hope of providing a literature basis for the sustainable development of traditional crafts. In practice, the findings of this study can help craftsmen better develop their creations and consolidate their passions. Likewise, by re-prospering craftsmanship, it will increase people's attention toward the practicalities of the sustainable development of crafts.

It is believed that sustainably developing craftsmanship requires the cooperation of craftsmen and the public. This is also the true meaning of handicrafts; from life, for life, and above life.

2. Theoretical Framework

2.1. Humanity and Technology: The Human Touch of Crafts and Its Value

In spite of the fact that traditional craftsmanship often uses the simplest materials and construction methods, it is not simply a form of "tech/skill", but instead a form of "culture". This traditional handicraft has a special connection with the region or place in which it is located; it is the connection and bond between people and nature.

Almost all craftsmen strictly adhere to the rules of the past in their production process, which is not due to a reluctance to adopt new technologies. It is the persistence of these craftsmen that allows these crafts to maintain their most simple appearance. Through these rustic and exquisite crafts, we can gain a deeper understanding of their culture and philosophy of life. In the case of mass-produced industrial products, this may not be possible.

Yanagi [21] believes that only those objects that are actually used in life are beautiful objects. This can also be understood from another perspective, in understanding Japanese aesthetics [22–25]. Yanagi also discovered beauty in everyday ordinary and utilitarian objects created by nameless and unknown craftsmen. According to Yanagi, utilitarian objects made by the common people are "beyond beauty and ugliness" [21,26–28].

In opposition to this, Shui-long's approach to traditional craftsmanship is primarily based on economic considerations. In his analysis of traditional craftsmanship, Shui-long emphasizes the "aesthetics of practicality", which means that crafting must respect the

inherent beauty of the utensils, as well as the characteristic beauty of the materials used. In addition, it must be a craft that reflects the tastes of the time and integrates them into ordinary life [18] (p. 25). Crafts are, in general, full of wisdom, and they are embedded in daily life in a seemingly simple way, and yet, despite playing a role, they convey a particular theme: the love of the mother or the view of the craftsman on the world. While industrial design incorporates the latest technology, it has been criticized for being too cold and lacking in temperature. We use the word 'temperature' here to illustrate that industrially designed products may not allow users to experience the craftsman's influence within the product. In short, industrial products seem to lack humanity. In addition to being convenient, these products satisfy people's desire in terms of fashion and style. There is no question that the "features" of these products are often soon replaced by a newer generation of products, and when the features of these products become obsolete, these products can be easily discarded. In contrast, crafts are durable and can last a lifetime.

Professor John G. Kreifldt of Tufts University has been engaged in the research of engineering psychology, human factors, and product design. The famous REACH toothbrush is one of his well-known achievements. However, he also has a keen interest and research interest in traditional culture and art. Kreifldt has unique insight into the products: "I not only value them for the money they may have cost but I also treasure and cherish them beyond their functions" [29] (pp. 27–38). Kreifldt further states that, in fact, he also collects crafts from different cultures and materials from many countries and regions, and he likes to play with these collections. Every time he plays with these collections, he enjoys the feel of a piece of handicraft in his hand, as well as its visual appearance. Kreifldt states: "I also 'feel' a connection between my hands and the hands of the craftsmen. I 'feel' a spiritual connection with them" [29] (p. 23). He also pointed out that it is only when the general public can appreciate the beauty of craftsmanship, and when people are willing to support craftsmen with practical actions, can we ensure that craft creation activities will be passed on.

Figure 2 shows a selection of the collection of crafts made by CHANG, Hsien-ping, who is known as a Living National Treasure. These crafts are hugely impressive and, whether as examples of exquisite skills or detailed representations, they are rustic and fascinating.

Figure 2. A selection of Professor John G. Kreifldt's collection of crafts made by Chang, Hsien-ping. (Source: Photographed and authorized by Professor John G. Kreifldt).

Audiences are often astonished by the exquisite crafts displayed in museums. However, people are interested but reluctant to experience the way in which we previously lived. What they lament is the story and connotations behind these artifacts. These artifacts are full of temperature; many collectors will take out their collections of utensils from time to time to play with and use, and when people touch these objects, it seems to create

a sense of connection with a craftsman they have never met. This feeling is not given by modern industrial products; at least, there is a certain degree of difficulty. People may value mass-produced industrial products because they pay for them, but when a new generation of products comes out, people cannot seem to wait to dispose of the old ones, even if they are not obsolete. However, are handicrafts rarely found in this situation. For example, a childhood toy. It may not continue to be used, but the individual is reluctant to throw it away. This may be human nature at play. Essentially, these objects are full of memories and warmth.

2.2. Craft Creation and Its Dissemination and Cognition

There is a dialogue between the audience and craftsmen as they appreciate the crafts. The theory of communication can further explain this phenomenon. Briefly, the craftsman is the coder and the audience is the decoder.

Knowledge and understanding of the craft may be relatively limited among most people. However, these individuals are among the main beneficiaries of handicraft services. Alternatively, if people do not possess a good understanding of handicrafts (including their production process and cultural connotations), this will only increase the distance between people and craftsmen, which will negatively impact their survival and enthusiasm. Due to this, it is impossible to achieve the goal of sustainable development. Communication theory plays an important role in this process.

Hall [30] proposed that audience members can play an active role in decoding messages, as they rely on their own social contexts, and might be capable of changing messages themselves through collective action. Fiske [31] indicated that these codes "consist of both signs and rules that determine how and in what context these signs are used and how they can be combined to form more complex messages". Decoding means that the message in which source has been encoded is interpreted by the decoder according to their own outlook and experience. The process of decoding involves the conversion of communication into thought.

Encoding and decoding are widely used in various fields of study [30–32], and their mechanisms can also be applied to the interpretation of handicrafts. In this study, we believe that people's ability to successfully 'decode' is an important aspect of communication.

Good communication is essential in helping the public better understand the ideas of craftsmen and the connotation of crafts. Handicrafts are expressions of the craftsman's creative intention. Through this process, the craftsman's imagination, thoughts, and feelings are reproduced. The purpose of these works is to implement ideas and expressions, and communicate them to the audience in order to ensure that there is an understanding between the craftsman and the audience [33]. Craft creation is an expression of the craftsman's pursuit of beauty. It has the following two inter-influencing characteristics:

1. Experience the "connotation" with "form";
2. Enrich the "form" with "connotation".

"Crafts" has a "form" context that transforms abstract "connotation" into concrete "form". Form (style) and connotation (idea) are different in expressing craft creation [34]. How does the relationship between "intention" and "form" become the concept of creative thinking in crafts? There seems to be a certain degree of correspondence between "form" and "intention", in that: to find clues to "connotation" in "intention".

Past research on crafts creativity has mostly focused on the role of the craftsman, while paying little attention to the role of the viewer (decoder), yet the viewer plays an integral role in the complete craft process. An understanding of the cognitive processes involved in art or crafts appreciation can improve their ability to create stunning works of art. From the perspective of crafts and creativity, concepts and intelligence are an integral whole. Therefore, Norman's [35] three psychological concepts can be modified into three modes: the craftsman mode, the viewer/decoder mode, and the handicraft [33]. The mode refers to the craftsman's conceptual understanding of the work of craft. The viewer/decoder mode refers to the process by which they perceive the external aesthetics and internal meaning

of crafts. Ideally, there is a high degree of congruity between the craftsman mode and the viewer/decoder mode, which allows the craftsman to effectively convey his/her message to the viewer by using language or symbols familiar to the viewer, and present them in a suitable context [36]. The decoder perceives the external form at the technical level, then comprehends the inner meaning at the semantic level, and finally reaches the emotional connection at the effect level [33,37].

The promotion of traditional crafts requires collaboration between government officials and non-governmental organizations, as well as good communication between craftsmen and consumers. To accomplish this, a cognitive model or pathway must be constructed. The craftsmen are coders, and the audiences are decoders. Therefore, from the perspective of the "decoding" by the viewer, exploring the cognition of "crafts creation" is helpful for understanding the process of creation. Such principles and models also apply to our observation and evaluation of the crafts (see Figures 3 and 4).

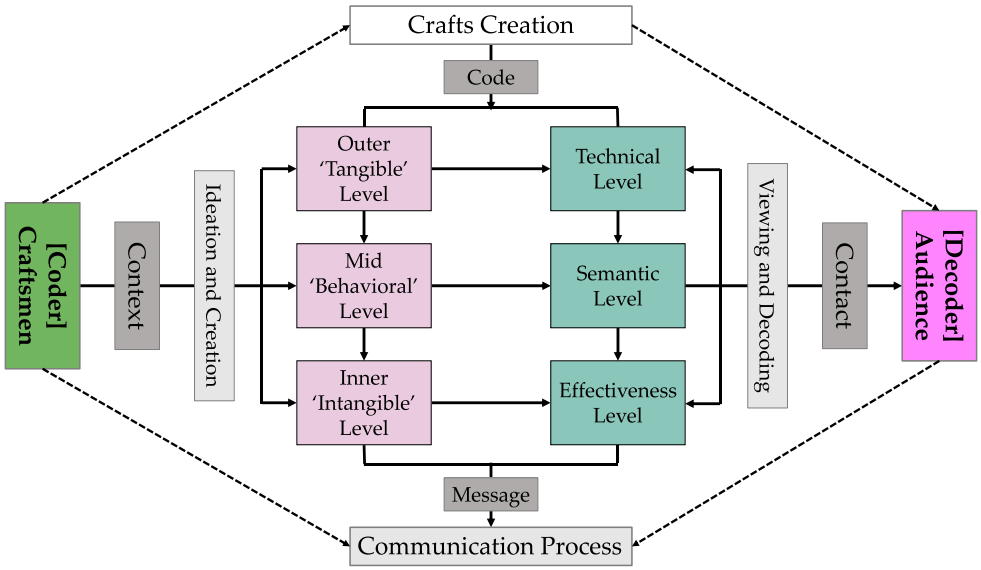

Figure 3. The communication matrix for evaluating crafts. (Source: this study).

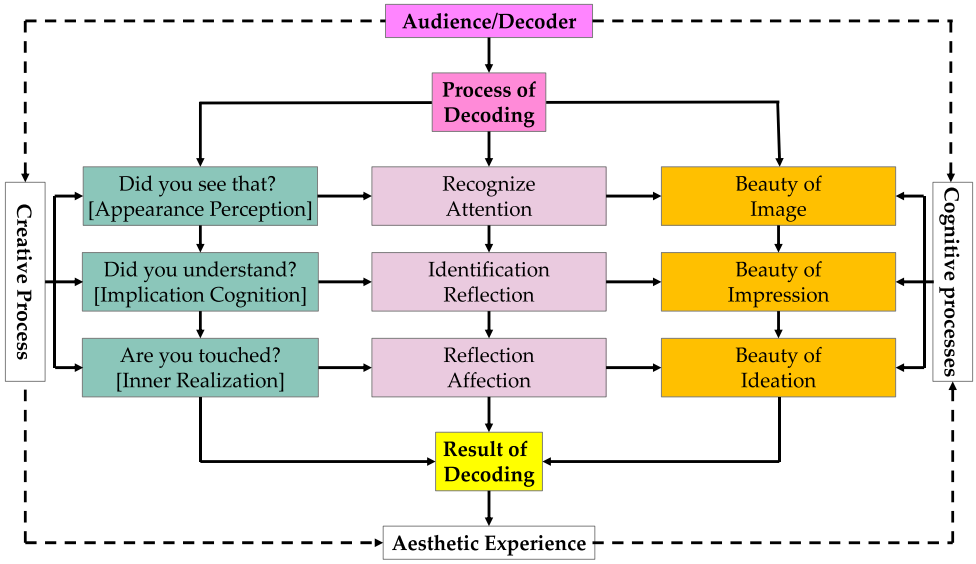

Figure 4. The cognitive model of the decoder's perception of crafts. (Source: this study).

3. Methodology

Taiwan's handicrafts have received increased attention in recent years as a result of continuous efforts by the government, academia, and industry. In spite of this, there is still much to be discussed regarding how sustainable development can be achieved in a meaningful manner. It would be beneficial to conduct exploratory research on this issue.

It is usually appropriate to conduct exploratory research in order to investigate complex phenomena that have not been adequately explained [38,39]. At the exploratory stage, case studies are useful for gaining an understanding of the "why" and "how" of a problem. Based on a detailed description of the case situation and problem statement, data are collected and analyzed systematically in order to gain a better understanding of the phenomenon and context of the case [40].

Semi-structured interviews are widely used in qualitative research [41]. Considering the practical needs of open and exploratory topics, we used a semi-structured interview method, and every answer was verified by the interviewee. As a result, respondents were free to express themselves without being restricted in any way.

3.1. Conceptual Framework of the Case Study

The long history of Taiwanese crafts has left many treasures, some of which have been collected by various museums, while others continue to play an important role in daily life. A traditional craft is an aspect of culture and a cultural product. Cultural product design is a process of rethinking or reviewing cultural features, and then redefining them in order to design a new product that can fit into society and that can satisfy consumers culturally and aesthetically [14]. It is important to integrate cultural characteristics into products to promote and preserve the culture of a region, as well as to increase the economic growth of society. In order to improve the cultural connotation of products, it is of great benefit to transfer cultural characteristics into them.

This study focused on the promotion of traditional crafts in Taiwan and, in addition to the relevant policies formulated by the government and the efforts of craftsmen, it is crucial for the audience to generate recognition. According to the procedural school of communication theory [31], if the craftsman's (sender/coder) signal is to be successfully communicated to the viewer (receiver/decoder), certain requirements must be met on three levels [33]. Thus, for the purposes of this study, crafts promote cognitive processes, including:

1. On the technical level, the craftsman must accurately convey the message he/she intends to transmit so that the decoder can see, touch, and even feel it. (Did you see that?)
2. On the semantic level, the decoder needs to accurately understand the message being transmitted. (Did you understand?)
3. On the effectiveness level, the message needs to affect the decoder in such a way as to elicit a particular response or behavior. (Are you touched?)

For the audience to understand the cultural significance of crafts, three steps must be followed: (1) attracting their own attention (recognition); (2) generating correct cognition (understanding); and (3) forming deep emotions (reflection) [2,33,37,42–44]. In short: "recognition", as a situational perception, indicates whether the craft appeals to the audience; "understanding", as an artistic cognition, indicates whether the audience can understand the meaning of the message it conveys; "reflection" is a psychological feeling that indicates whether the audience can be moved in the process of viewing the craft.

Therefore, this study constructs a conceptual model to examine the communication process and cognitive patterns between craftsmen and audiences (see Figure 5).

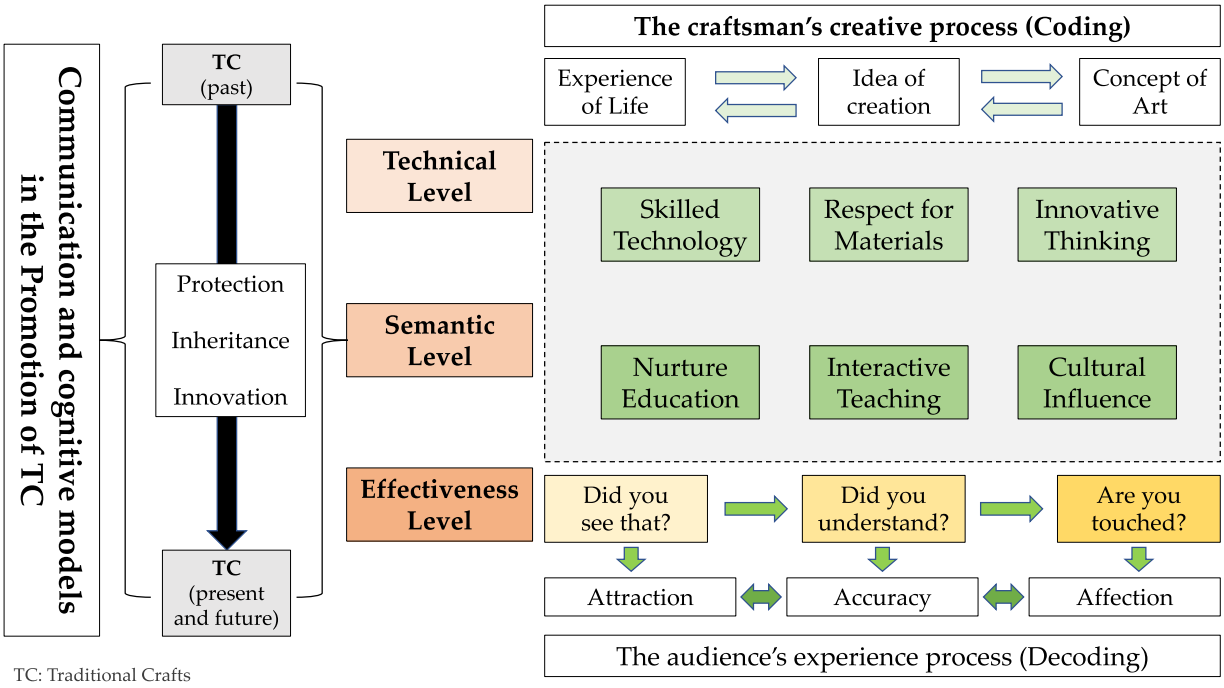

Figure 5. The cognitive process of the promotion of Taiwanese crafts: a conceptual model. (Source: adapted from [30,31,34–36]).

3.2. Procedures

A literature review is essential for clarifying the key concepts and values of craftsmanship, craft development, and inheritance, as well as interviewing masters who have been involved in the craft creation process for a considerable period of time. Due to COVID-19, face-to-face interviews were moderately reduced during the summer of 2022. Instead, telephone and email interviews were conducted.

3.3. Subjects

In many countries or regions, a Living National Treasure is a term for those individuals certified as Preservers of Important Intangible Cultural Properties. It also includes many craftsmen. This honor is given to individuals who have made outstanding contributions to their fields over a long period of time and have already integrated craftsmanship into their daily lives. The exquisite crafts they produce display their ingenuity and wisdom, as well as their adherence and inheritance to the profession.

Furthermore, there are many craftsmen, and although they have not received similar honors at this time, this will not affect their creation and thoughtfulness in the slightest. This kind of recognition from people is also important to provide support for craftsmanship for a long time.

Based on this principle, this study selected three Taiwanese craftsmen who are well-known in the field of weaving. In addition, the authors have a close personal relationship with the three craftsmen. The three craftsmen have conducted their work for a long time, and hoped to share their views.

Table 1 provides the basic information pertaining to the three craftsmen. They have all been weaving for at least a few dozen years and have a wealth of experience, as well as their own unique and in-depth insights. Grandma Yang can be regarded as a living fossil of folk traditional crafts; Mr. Chang was awarded the honor of Living National Treasure by the Ministry of Culture; Ms. Su also recently received affirmation from the Nantou County Government. Therefore, their perspectives on craftsmanship are representative, to a certain extent, which is of great benefit to our in-depth understanding of traditional Taiwanese craftsmanship. Figures 6–8 show the craftsmen and their masterpieces.

Table 1. The subjects.

Craftsmen	Brief Introduction	Masterpiece
YANG, Lichahua	Grandma Yang was born in 1930 in Yuanli Township, Miaoli County, Taiwan. She learned to weave from her mother, who was an expert weaver, and whose high-end straw hats were exported to Japan. Since she was a child, she had learned from her mother. She worked on straw hat weaving before getting married. In the past few years, since her children have all started families, she has regained the weaving techniques that she mastered during her childhood. Now, she is trying new techniques every day, and weaving has become an integral part of her life.	
CHANG, Hsien-ping	As a member of a weaver's family, Mr. Chang was also influenced by his family at a young age. He has been challenging himself and abandoning the traditional form of art since 2000. He believes that only pure craftsmanship can communicate the heart of the creator and make others feel warmth as a result.	
SU, Su-jen	Most craftsmen are modest and refuse to be addressed as masters, such as Ms. Su. Growing up in her family's bamboo forest, she was exposed to bamboo weaving technology to a limited extent. After this event, she did not work as a weaver for a long period of time. As a participant in the workshop since 1995, she has begun to create bamboo weavings. Throughout her career, she has worked in a variety of fields. According to her, the principle of mass production is no longer relevant in the 21st Century. It is essential for the process to return to its original state, and the artist should make the work available with the highest level of efficiency and quality, which is the most ideal method.	

Source: Compiled by the authors. All crafts have been authorized by the three craftsmen.

(a) **(b)**

Figure 6. (**a**) This was an event organized by the NTCRI. The organizer invited Grandma Yang, a 92-year-old weaving master, to demonstrate in person. (**b**) Professor Rungtai Lin visited Grandma Yang at her home in June 2022, which gave the authors an opportunity to see how she weaves and listen to her reflections on traditional craftsmanship. (**Source**: authorized by the NTCRI and Yang's family).

Figure 7. This teacher training course about bamboo weaving was organized by the government of Miaoli County, Taiwan. Mr. Chang was invited to give a lecture. Such works were completed by all the participants at the end of the course, and the photo was taken by Mr. Hu, Peng-sheng, a journalist from *United Daily News* (**Source**: [Bamboo weaving master, 2022]).

Figure 8. Ms. Su established "23 Studio" in Zhushan Town, Nantou Country, Taiwan. Besides creating exquisite bamboo crafts, she also actively participates in various lectures and seminars. (Source: authorized by Ms. Su. Images were reproduced from her Facebook account. Due to objective conditions, we were unable to contact every student in the photo. To avoid disputes regarding portrait rights, we have blurred the faces of these students).

4. Result: Analysis and Discussions Based on Feedback Provided by the Subject

The three craftsmen selected by this study are all involved in weaving. Mat grass or bamboo are the materials that they use. In nature, mat grass and bamboo are simple and unpretentious. They can be transformed into exquisite crafts through the ingenuity and dexterity of craftsmen, and most have practical value and appear in daily life. In the authors' view, this is one of the important connotations of the process. They use simple materials and changeable forms to create a unique aesthetic of life. At the same time, these crafts can also be used in life, or as ornaments for people to see.

The relationship between form and ritual in artifacts, which the authors explored in another study, can also be used to think about the value and meaning of crafts [45]. In other words, if industrially designed products need to meet the function/high-tech, then crafts are closer to the level of feeling/high-touch.

In the next section, we discuss the feedback provided by the three craftsmen. It should be noted that their views may be subjective and may not be applicable to every field. These views, however, reflect the thinking of three craftsmen who have been working in the craft for many years. Therefore, we believe that they still have an important reference value, or can at least be used to stimulate further discussion.

4.1. From "Involuntary" to "Natural": The Fusion of Craftsmanship and Life

Although many craftsmen were exposed to handicrafts in their early years, because of the economic conditions of their families, they were forced to produce some handicrafts for sale in order to supplement their family's income. These difficult and necessary activities, however, became part of life and became natural as time passed.

In the opinion of the authors, this is also consistent with the purpose of the early establishment of different craft workshops. There is often a long and complicated process, it can be difficult to finance, and it may be difficult to maintain enthusiasm for a long period of time. As a result of holding various workshops, the government protects and inherits traditional crafts, but it also helps craftsmen to systematically master craft skills, which can then be exported overseas through government participation. Additionally, it will increase the popularity of Taiwanese handicrafts and benefit the craftsmen.

Today, the three craftsmen do not have to rely on crafts to support their families. Craftsmanship has been an integral part of their lives. As of this moment, they are more committed to preserving the inheritance of crafts, such as by recruiting apprentices, or by promoting traditional crafts in a variety of ways. It may be that the younger generation is curious about traditional crafts, or they may love them, but what is more important is how to guide them toward a deeper understanding of the craft and its culture. We may not care too much about sunlight, air, and water, but once they are no longer available, we become concerned. Although there is no attempt to elevate the process to such a high level; everything is about speed in this modern age of high-speed development. For example, life has been influenced by fast food culture for a long time. This implies that the integration of craftsmanship and life should not simply be a slogan or an aesthetic feature, but should have a deeper meaning.

4.2. Empty Cup Mentality: Keeping Pace with the Times Can Achieve Sustainable Development

One view has been stated as follows: In general, basic craft skills soon reach an advanced stage in many areas, and then remain, for a long time, unaltered. Even less subject to change, once established, was the basic existence of the professional craftsman [46] (p. 41). In this study, the above statement is likely to be ambiguous, and may need to be amended in light of each individual situation.

The "unaltered" feature of craftworking mentioned here actually refers to the fact that a certain technique has been used by craftsmen so repeatedly that it becomes almost magical, and a habit. There is no need to change this feature. Moreover, for traditional crafts, following ancient methods is not equivalent to being conservative. In terms of the authors and the three craftsmen interviewed, we can be sure that the creative thinking of the craftsmen has changed. One concept that was proposed was: People have to be empty in order to be full. If people wish to learn more, they should begin by thinking of themselves as empty cups, rather than being complacent. Craftsmanship is fascinating, precisely because it gives a new look and life to seemingly ordinary materials. Following the production rules of the past is an attitude and a respect for craftsmanship. However, craftspeople are also willing to pay attention to popular trends and integrate various elements into their creations. These crafts are traditional on the inside, and many modern elements or styles can be seen on the outside.

The "empty cup mentality" is not to blindly deny the past, but to have an attitude that denies or empties the past, integrates into the new environment, and considers new work and new things. Strictly speaking, the three craftsmen in this study, whose are highly

skilled and have accumulated decades of experience, said that they are number one. It is no exaggeration, and they are still very humble; treating every creation as a first.

Furthermore, they are often eager to learn new things, rather than become complacent. Grandma Yang, for example, continues to experiment with new weaving methods in her daily grass weaving. The authors used the summer to visit her home, and she mentioned that she is still learning to knit every day. The authors questioned this, asking why did she do this when she was already very skilled in weaving? She said: "The previous students have fallen behind, and we must learn what the young people are doing now?". Her answer not only explains the approach of "living to learn from old age", but also explains the true meaning of the "empty cup mentality".

Craftsmen are constantly creating new works because of this mentality and belief. Handicraft has survived to this day thanks to the unremitting efforts of all craftsman. In order to achieve sustainable development, all individuals must work harder.

5. Conclusions and Suggestions

It has been a glorious century for Taiwanese craftsmanship, and its toughness and connotations have been well protected and are being increasingly recognized. Through the various craft exhibitions and workshops sponsored by either the government or individuals, continuous breakthroughs and innovations in Taiwanese crafts can be seen, as well as the visual feast generated by these refreshing crafts. Therefore, it can be concluded that Taiwanese craftsmanship has already developed in a fruitful manner, and continues to do so.

It is common for handicrafts to carry cultural traditions, and even a philosophy of life, associated with the people they represent. In some ways, the absence of culture may limit the high-quality development of society. The protection of handicrafts needs to be strengthened, as well as an exploration of ways in which they can be used to achieve an effective model of sustainable development. Additionally, contemporary handicrafts have taken on a variety of "forms" that differ from those of the past. The belief of the authors is that it is important to maintain the connotations of handicraft, and adhere to its key essence and spirit in order to highlight the principle of sustainability. Additionally, this will prevent handicrafts from becoming obsolete, and thus avoid losing their distinctive appeal.

Three aspects should be considered in order to achieve sustainable development:

1. **Cultivation from an early age: Education that should attach importance to craftsmanship.**

Currently, there are few schools offering traditional craft departments, and most of them are in colleges and universities. One respondent suggested that the development of craft education may need to start small. It is possible that one does not need to learn too much technological skills at first, but time must be taken to allow a student to build aesthetic literacy.

2. **Establish the core essence of creative thinking: Keep pace with the times to make crafts continue to transform.**

Innovation is the vitality of all things. In particular, traditional craftsmanship needs to stick to one side, such as some ancient methods of processing materials. However, it is more necessary for creators to have the ability to continue to innovate. This kind of innovation comes from the beauty of training since childhood, but it also depends on the empty cup mentality. In this way, we can continue to give new life to crafts.

3. **Integrate into daily life: Let crafts better reflect the true meaning of life.**

Crafts can also be roughly divided into two categories: one is biased toward artworks, which are naturally expensive; the other needs to be grounded and close to life. For consumers, if the craft is too expensive and high-end, it may deter people. Crafts are derived from nature and used for life; this kind of handicraft not only causes the traditional style to reappear, but also meets with the modern aesthetic and people's practical needs, which is doubly effective.

6. Limitations and Follow-Up Research

The authors were aware that exploring and discussing these three topics is not an easy task. Almost every topic can be written independently. As a pilot study, the research team tried to stimulate more people's interest and attention to traditional handicrafts in Taiwan through this study, and jointly participated in the research of these topics.

Additionally, we only interviewed three craftsmen due to the limitations of the conditions, so there may be some omissions in the research findings and conclusions. It is our belief that, just as crafts have characteristics that are difficult to replicate, so too is the perspective of each craftsman. However, it must be verified in future studies whether these views can be generalized more broadly. In addition, we expect a growing number of people to pay attention to how Taiwan's traditional crafts are now being reinterpreted in the modern age, providing a basis for sustainable development.

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Article

Empirical Study on Design Trend of Taiwan (1960s–2020): The Evolution of Theme, Diversity and Sustainability

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Abstract: With significance in improving and developing local design culture as well as in supplementing global design history, this essay describes a study on the past and a clear prediction of the future by exploring Taiwan's design history from approximately the 1960s to 2020 based on the evolution of theme, diversity, and sustainability. In this research, the Python programming language is used to apply three algorithms of term frequency–inverse document frequency (TF-IDF), Simpson's diversity index (SDI), and latent Dirichlet allocation (LDA) to conduct a text exploration of design journals. The results show the following: in the 1960s–1980s, the evolution of theme focused on evaluation strategies, technical practices, and foreign cultures, on digital design, multiculturalism, and design aesthetics in the 1990s, and on emotional human factors, intelligent technology, and local culture since the beginning of the 21st century. Local culture and intelligent technology are the main driving forces of the current design industry. Regarding diversity, after a period of rapid change and stable rising, it has shown a downward trend in recent years. This indicates that current design needs to be stimulated by external environmental variations. Sustainability was focused on technology, the market, and education during the 1960s–1980s; on consumers, design education, and eco-design during the 1990s; and on integration across fields during the 2000s–2020. In order to gain a wider perspective of the complete design context of Chinese culture, the results show the current and future trends of the academic community, in addition to a reference for the study of the design histories of other areas in the world.

Keywords: design context; text mining; periodicals; trending topics; trend of diversity; sustainable design; glocalization

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1. Introduction

With the change in global design in the 1960s, modern design rapidly transformed into postmodern design [1]. At that time, both industrial and academic circles questioned the modernism that had emerged in the early 20th century, as well as the functionalist and rationalist design concepts upheld by the modernists, such as "Form Follows Function", which was thought to be the main reason for the failure of modern urban development [2]. Such questioning and resistance gradually resulted in the formation of another independent value that has divided the cultural field, a sort of intellectual irrationalism, moral cynicism, and emotional hedonism, and a form-limited principle that rejects modernism. However, Zhou (2018) pointed out that it was essentially the continuation and development of modernism, namely, a postmodernist period characterized by "diversity" [3]. In such a context of inheritance and transition, it can be seen that the 1960s represented a critical transition period for modern design, representing the transition from rational design to emotional design, as well as that from modernism to postmodernism.

In globalization and culture, while enthusiasm dominated as a viewpoint in the 1990s regarding the notion of globalization, in the aftermath of the 2008 Great Recession, the worsening of the COVID-19 pandemic, and accelerated cultural conflict among nations and ethnic groups, skepticism around globalization has become widespread [4]. Hence, the notions of globalization and glocalization are a means for grasping an increasingly complicated reality [4]. Studies have pointed out that the problematic nature of global–local relations has emerged as a key research theme [4–6]. In the era of integration and globalization, it not only bears significance in the study of local development pathways but also created the development modes of local cultures. In addition, it also presents a more diversified global culture, which can subsequently alleviate the conflicts and promote global cultural integration and development.

With the greater attraction to globalization, more topics concerning globalization have emerged, e.g., the disposition of global strategy in the issue of climate change [7]. The COVID-19 pandemic has increased the importance of global strategies for sustainable development [8,9]. 'The Hannover Principles' noted: sustainable globalization attributes give rise to mutual dependence among the human system, industry, and the environment [10]. Therefore, the question of how to achieve sustainable development in resource-based areas is also a concern of governments [11–13]. However, design serves a key roles in sustainability [14,15]. Since the 1960s, sustainable design can be considered as the discussion of 'the ethics of design' from McDonough's green economy concept of 'Cradle to Cradle: Remaking the Way We Make Things' and 'Green Design, Universal Design, Friendly Environment' in a broad sense [10,16]. Since the rapid industrialization of many nations in Asia, the consequent rapidly rising levels of water, air, and land pollution have raised concerns about the unsustainability of current growth patterns [17]. It is important to explore the development pathway of sustainable design in Asia and to provide a reference for other areas in the world to strengthen their knowledge of environmental obligations in a regional and even global sense.

The design of Asia has acquired a key role [18,19]. However, design cultures are different across Asia and are interconnected [20]. In the era of globalization, how do designers find the balance between local culture and international ideological trends, and form their own unique expression of visual language? How will the design context of Chinese culture act as a key component of Asian culture development in the future? However, the current construction of modern design history is mainly focused on recording the development of Western modern design, while Chinese culture and even all Asian regions are almost in a subordinate position [21]. The history of design, as a discipline, was based on assumptions on what design is and how we studied design in the past, and we should not ignore the dynamic crossing of regional knowledge boundaries. Thus, the current design researches should have included new subjects, such as design researches involving Asia, Africa and other regions [22]. Current research into the history of modern design against the background of Eastern culture is still limited, and it is not enough to constitute a complete modern design history with regional cultural characteristics. Therefore, with the increasingly serious trend of global cultural homogeneity, it is of positive significance to reinforce design history research from the perspective of Eastern culture by organizing the development context of Eastern history and culture, and by exploring the relations between social background and design development.

As one of the centers of Chinese cultural heritage, Taiwan also existed in an important period for the initial development of modern design in the 1960s [21,23]. Since the 1960s, Taiwan's design industry has undergone original equipment manufacturer (OEM), original design manufacturer (ODM), and original brand manufacturer (OBM) processing. These three stages are not only a sign of the times but also represent the transformation of design thinking, the development of creative tools, and the evolution of technical styles [24]. Taiwan's cultural variety and distinction offer a potential application in the field of design; especially because designing local features into products appears to be increasingly important for the global market, cultural features are considered to be unique characteristics

that can be embedded into a product for both the enhancement of its identity in the global market and for a better individual consumer experience [25]. Furthermore, as Taiwan is typically a resource-limited area, experts have noted that exploring Taiwan's sustainable development trend bears indicative significance for globalization [26–28].

With the development of the discipline, the literature has become an important source of information [29]. In the period of underdeveloped information, "periodicals", as one of the main methods of information dissemination, became an important part of the literature. The systematic analysis of the literature published in academic journals was not only conductive to the tracing of the latest achievements of the academic community, and to updating and enriching the existing knowledge system, but also provided a reference to the theories and practices of teaching. It also helped predict the development and evolution of related disciplines, future directions, and thematic trends [30–32].

In summary, this study adopted text mining to study the development context of Taiwan's design industry from the 1960s to 2020 as well as to study the evolution of theme, diversity, and sustainable design trends using the Python language. We adopted the following three research objectives:

- To study the evolution of theme concerning Taiwan's design development from the 1960s to 2020;
- To study the diversity of Taiwan's design development from the 1960s to 2020;
- To explore the sustainability of Taiwan's design development from the 1960s to 2020.

The remainder of this paper is organized as follows: Section 2 briefly reviews the development of Taiwan's modern design from the 1960s to 2020. Section 3 describes the text-mining method in the Python programming language, research materials, and processes. Section 4 introduces the empirical results of the evolution of theme, diversity, and sustainability. Section 5 discusses the empirical results of these three aspects. Finally, Section 6 presents the conclusion.

2. Taiwan's Design Context

A national design's development process relies on the planning and support of strong and relevant policies [33]. Raulik-Murphy et al. (2010) put forward the concept of a national design system based on the national innovation system, economic cooperation, and development, namely, the design development framework of a country. They pointed out that a national design system should contain four elements: design support, design promotion, design education, and design policy [34]. In addition, Wang (2016) also pointed out that the academic theories are derived from the rational thinking of social intellectuals on artistic design and are constructed based on social, political, economic, and cultural advancements [35]. Hence, this paper combines the development of four aspects (design policy, design education, social activity, and academic research) of Taiwan's modern design from three periods (1960s–1970s, 1980s–1990s, and 2000s–2020), as shown in Table 1.

In summary, through the above-mentioned analysis of design development in Taiwan from the 1960s until today, we can roughly understand modern design development in Taiwan: in the OEM stage from the 1960s to the 1970s, Taiwan started a dialogue with global design through a two-way exchange strategy including "import" and "export", resulting in the rapid development of domestic modern design; during the ODM stage from the 1980s to the 1990s, Taiwan promoted a cross-domain cooperation strategy across "human factors" and "digital" as well as practiced user-friendly design through "technology based on people"; during the OBM stage, which started at the beginning of the 21st century, Taiwan advocated for the direction of aesthetics and cultural creation that integrates "emotion" and "technology" and promoted "emotional" design, which integrates technology into design and creativity.

Table 1. A list of the literature on research into trends in the field (organized in this study).

First Stage: 1960s–1970s, The Stage of Technological Development Centered on Production	
Design policy	The Industrial Development Bureau of the Ministry of Economic Affairs aimed to guide national design development strategies in response to changing industrial needs [33]. In 1967, the Chinese Industrial Design Association (CIDA) was founded, and the China Industrial Design and Packaging Center was founded in 1973, to assist in the transformation of Taiwan's economic and industrial structure.
Design education	Early design education gradually took shape in the fine arts discipline. In 1953, the Art Department of the Normal School began to teach courses in pattern design and color science. Up to 1957, the field of design education gradually shifted from pure arts to arts and crafts. In 1962, the National Taiwan University of Arts restructured the art printing and art engineering specialties to three-year majors, officially opening the door to design education [36]. Additionally, foreign experts were invited to teach in Taiwan [37].
Social activity	The earliest design concept in Taiwan came from the Council on U.S. Aid (CUSA), which promoted industrialization in Taiwan through policies such as introducing foreign scholars and experts, as well as using public funds to send talents to study abroad [38]. In 1966, the China Productivity and Trade Center sent some chosen students to study in Japan, which played an important role in design development in Taiwan [39]. At the same time, private institutions also prepared to set up organizations to promote handicrafts and the industry [40].
Academic research	With the multi-dimensional promotion and popularization of the design industry due to policy strategies and social activities, a large number of publications introducing design were also issued, such as *Designer*, *Designer & Designing*, and *Industrial Design*, which brought then-current design concepts to the information-poor design industry.
Second Stage: 1980s–1990s, the Stage of Cultural Connotation Centered on Design Image	
Design policy	From 1989 to 2004, The Foreign Trade Association formulated a three-phase five-year plan [24]. The 1989–1994 "Industrial Design Development Strategy Five-Year Plan" and the 1995–1999 "Comprehensive Product Capability Improvement Plan" led the design industry in Taiwan from germination to maturity. Taiwan's human factors engineering was enlightened and developed during this period. In 1984, the "Human Factors Engineering Promotion Group" established by the National Science Committee for Long-term Development improved academic research and related technical standards for domestic human factors engineering and accelerated international exchanges in research related to human factors engineering [41].
Design education	Industrial design education gradually received attention, and the design profession gradually became popular. University courses were basically based on the Bauhaus education system, providing functional practice-related courses. By the 1990s, numerous schools in Taiwan had decided to integrate resources and merge their art-, design-, and media-related departments for the establishment of design colleges, art colleges, and masters' research institutes.
Social activity	The Product Design and Packaging Center, Design Promotion Center/CETRA (DPC/CETRA), Fashion Color Association, Handicraft Development Center, and other institutions were founded during this period to guide the design ability and technology of individual key industries through multi-point public legal entities.
Academic research	Under the impact of the regional design trend of postmodernism, the topic of "Taiwan Studies" gradually gained attention during this period. Many monographs related to local design culture emerged during this period [42,43].
Third stage: 2000s–present, the Stage of Emotional Technology Centered on Brand Image	
Design policy	The Executive Yuan promoted the "Challenging the 2008 National Development Key Plan" in 2002, and approved the "Taiwan Design Industry Take-off Plan", as policy tools to promote the design industry. Such policies helped integrate design continuously into life, provide support to the industry, cultivate talents, and enhance international competitiveness. The Legislative Yuan passed the "Cultural Creation Law" in January 2010 to further promote the use of "Cultural Creation" as "soft power" for the country's development [24].
Design education	New design disciplines emerged in response to the development of the science and technology design industry. In 2001, Mingdao University created the first department, named the "Digital Design Department", with digital media as its main body, information technology as its tool, and design integration as the goal. In terms of the academic system, doctoral education was further developed in the field of design to promote academic research education.
Social activity	The implementation of policy plans has made the design industry in Taiwan more competitive, as Taiwan successfully gained the right to hold the Taipei World Design Expo 2011, the World Design Capital Taipei, and the World Universiade, having laid a good foundation for design development in Taiwan [44].
Academic research	In 2001, Taiwan developed its knowledge economy and put forward the concept of "cultural power", which transforms culture into economic advantage by observing globalized industry development and the knowledge-based economy. With the development of intelligent technology, the further promotion of user experience and participatory design trends gave designs more diverse perspectives [45].

3. Materials and Methods

According to the research purposes, this study selected the main text contents published by *Industrial Design* since its inception in 1967 and used text-mining techniques for analysis. This section explains the research methods and steps, including data preprocessing, article categorization structure, categorization work progress, and categorization reliability calculation.

3.1. Research Objects: Industrial Design

Industrial Design has existed for more than half a century since its establishment. As the longest-lived publication among the existing design journals in Taiwan, it records the relatively complete history of design development in Taiwan [21]. Professionals have studied the cover design change, as shown in Figure 1, from points, lines, and planes to photography, and then to computer graphics, reflecting the technology development of the Taiwanese design industry [24]. The author (2019) compared the four basic visual elements from the perspective of current psychological group cognition by selecting the covers of the first 10 issues of the *Industrial Design* magazine and 10 posters from the Bauhaus period. The research results show that early designs in Taiwan mostly originated from the design ideas of the German Bauhaus blended with Japanese culture, and the modeling style developed towards a rational geometric function. These studies show that *Industrial Design* has great importance for the development and influence of design in Taiwan [21]. Therefore, the design journal was chosen as the subject in this study in order to conduct an analysis according to the research targets mentioned above.

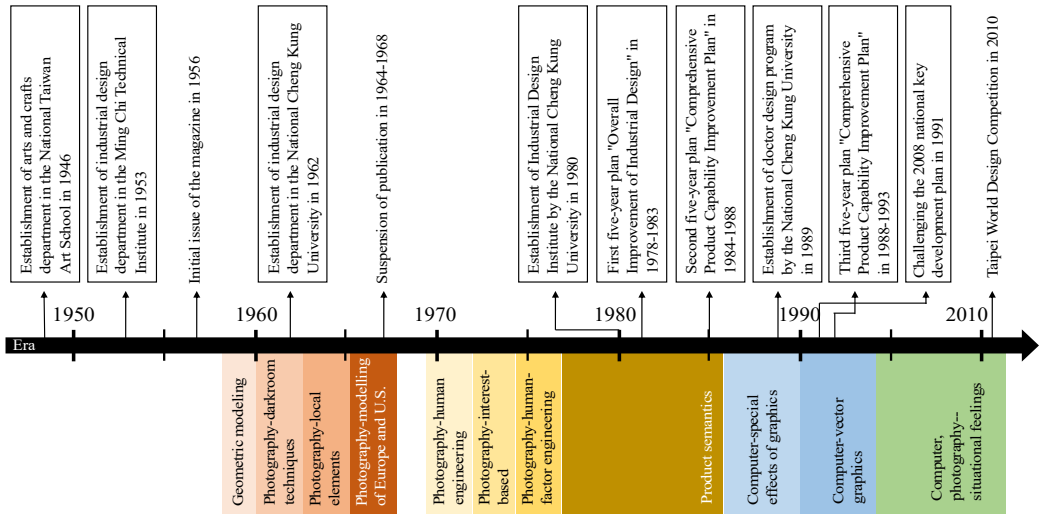

Figure 1. Evolution of the cover design concepts of *Industrial Design* magazines (Redraw from [24]. Copyright 2013 Lin and Lin).

3.2. Research Methods

As a constantly advancing technological tool, text mining is applicable to processing a huge amount of text data. It performs document editing, organization, and analysis processes by combining qualitative and quantitative research and using linguistics, statistical analysis, and other techniques. The purpose of this is to ascertain content facts and trends and mine the useful value of hidden features [46–49]. The main procedures of text mining include data retrieval and processing, word segmentation, feature selection, categorization and clustering, text representation, and interpretation [50,51]. It can be used to analyze and explore academic literature of different structural types, such as theme identification and trend analysis [52–55]. In the era of big data, new ideas and methods have arisen in corpus linguistics research from natural language processing (NLP), as a branch of artificial intelligence [56]. The Python language is often used for text analyses in NLP, such as text processing and understanding, as well as semantic and sentiment analysis. It realizes data

analysis and processing by supporting various algorithms with overloaded operators and dynamic types for functions, modules, numbers, strings, and other elements [57].

As Chinese and English are structurally different, the word segmentation used in text mining for English texts is not suitable in the Chinese field [58]. Therefore, Chinese scholars have developed methods that are suitable for Chinese text mining in related data cleaning and analysis [59–61]. Among them, Hsu et al. discussed how text-mining techniques can be used to explore the features or knowledge contained in a large number of Chinese news documents and proposed a mining procedure suitable for Chinese news documents [58], as shown in Figure 2. It is carried out in two steps: the first step is to preprocess the text with existing and new words to extract key words; the second step is to set the mining mode and explore domain trends and feature differences in combination with domain knowledge. Based on this mining structure, this research mainly used the Python language to carry out three algorithms, namely, term frequency–inverse document frequency (TF-IDF), Simpson's diversity index (SDI) and latent Dirichlet allocation (LDA), as well as the text mining of the researched texts according to the three research purposes.

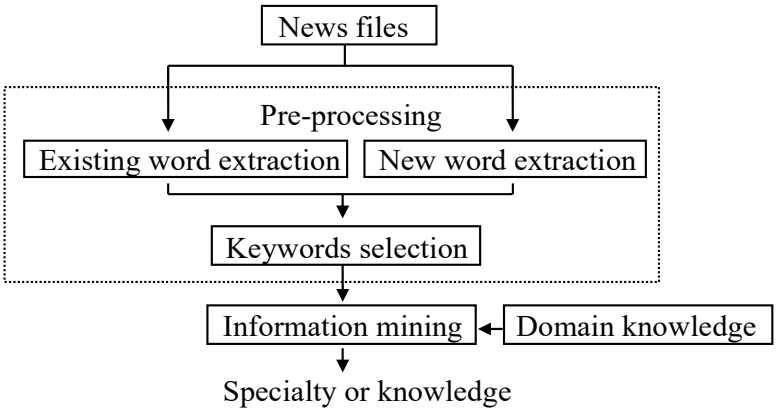

Figure 2. Chinese news document mining framework (Redraw form [58]. Copyright 2001 Hsu and Chen).

3.3. Research Process

Through the above-mentioned literature review, this study carried out empirical studies as follows (Figure 3): first, the key textual content of Industrial Design was preprocessed using Python and KJ statistics; then, the clustering analysis of the subjects was carried out using the K-means++ algorithm so as to study the evolution of theme, diversity, and sustainable design trends using TF-IDF, SDI, and LDA, respectively; finally, a conclusion was drawn.

3.4. Preprocessing of Data Text

Articles are mainly divided into three types: structured, semi-structured, and unstructured articles. Among them, a semi-structured news article usually briefly describes the news in its first paragraph, and therefore, important words in the text will appear in the first paragraph of the summary [58]. *Industrial Design* used semi-structured articles in the form of news reports from its first issues to issues 102, 104, 106, and 108, while issues 103, 105, 107, and 109–142 used structured articles in the form of academic papers. Based on these article characteristics and composition structures, this research finally obtained 1420 articles containing valid texts, including 948 semi-structured articles and 472 structured articles, by selecting the first paragraphs or the first 300 words of semi-structured articles of *Industrial Design*, as well as the titles, abstracts, and keywords of the structured articles from January 2008 to December 2020, excluding non-academic articles in the form of work displays, college introductions, overseas news, etc.

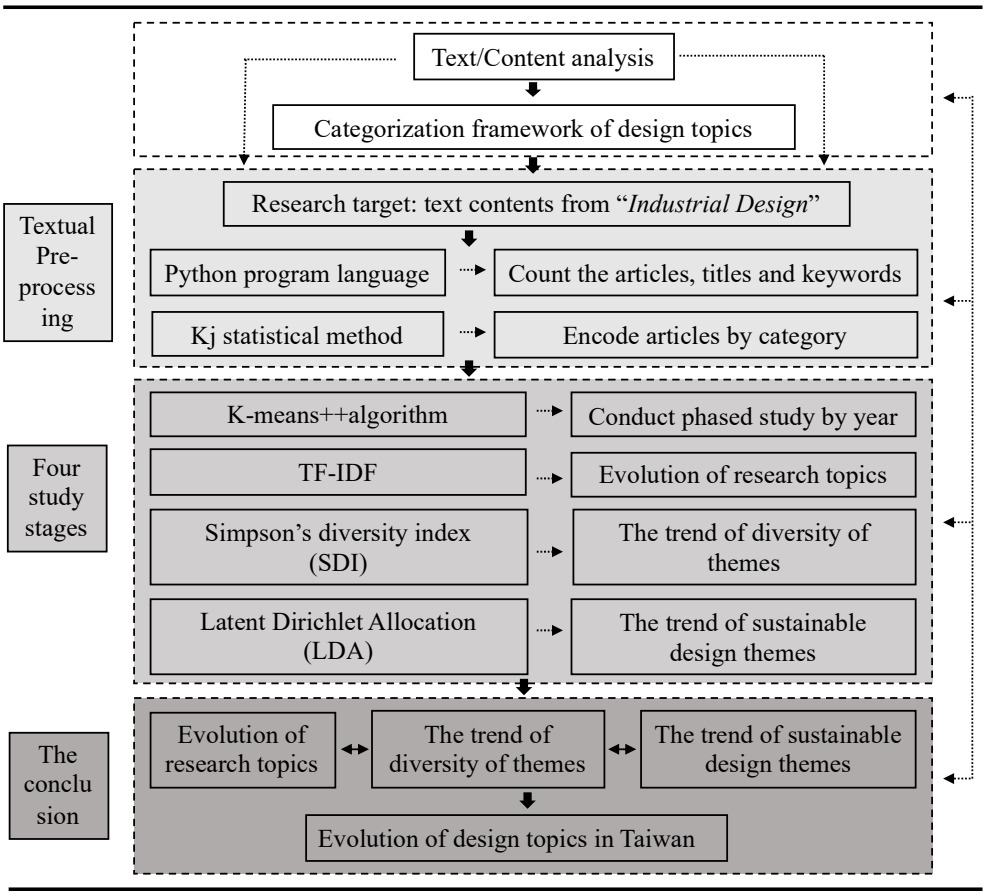

Figure 3. The flow chart.

Python was then uniformly used as the programming language. Regarding word segmentation, this research applied the jieba as its word-segmentation solution (http://github.com/fxsjy/jieba/ (accessed on 13 March 2021)), which is currently commonly used in academia. It was carried out in three steps: first, the keywords of each article were obtained in four processes, namely, eliminating single-character terms, extracting nouns and verbs, first paragraph vocabularies and frequency rules, and filtering general vocabularies; second, high-information vocabularies were further extracted using TF-IDF. This is a weighting method that considers the differences in text features. Compared with word frequency, TF-IDF accurately expresses the characteristics of the text [35]. Therein, stopwords were based on the Chinese stopwords database of Harbin Institute of Technology (https://github.com/goto456/stopwords/blob/master/hit_stopwords.txt (accessed on 13 March 2021), and further combined with manual input methods to add common vocabularies for design industry characteristics and to disable general vocabularies, such as design, influence, and other terms. Finally, for the vocabulary of the text research, the TF-IDF value in each article was calculated separately to select the top 20 representative words of the TF-IDF value as the research objects. After the above-mentioned text preprocessing, the basic statistics of the text data of *Industrial Design* are shown in Table 2.

Table 2. *Industrial Design* text data summary after text preprocessing (formulated in this research).

Total Number of Articles	Total Number of Characters in Articles (Excluding Punctuation)	Total Number of Words in Articles	Total Number of Words after Removing Stopwords
1420	273,003	121,400	58,439

3.5. Article Categorization and Coding

For the identification of key points of research topics in different articles, this research categorized 1420 *Industrial Design* articles to construct research topic categories. Analyses were conducted in two steps: In the first step, two design professional researchers conducted the coding work independently and categorized minor sub-topics against the main contents of each article by the KJ method. In the second step, minor sub-topics were categorized into middle sub-topics and then into major sub-topics by three experts based on the category list framework of Huang and Yan (2007) [30]. The specific category content of each sub-topic is shown in Appendix A. The basic data of the two researchers and three experts are shown in Table 3. The final categorization results are 273 minor sub-topics, 21 middle sub-topics, and 9 major sub-topics (Table 4).

Table 3. Basic Data of Interviewed Researchers and Experts.

A	Researcher 1	Researcher 2	Expert 1	Expert 2	Expert 3
B	PhD student, Creative Industry Design Institute, National Taiwan University of Arts	PhD student, Creative Industry Design Institute, National Taiwan University of Arts	Chairman of a design company, fashion brand president and brand director, PhD in design, regional visual director of *The Economist* magazine in Taiwan.	Master of Art Institute of National Central University, planning research of a design company	Visual director of a design company, assistant professor of visual design in a certain university.
C	Once	Once	Once	Once	Once
D	2021.5.8	2021.5.8	2021.5.16	2020.5.27	2021.5.13

Table 4. Categorization of research topics of articles in *Industrial Design*.

Major Sub-Topics	Middle Sub-Topics	Major Sub-Topics	Middle Sub-Topics
(BC1) Design communication and practical research	Visual practice design and application	(BC6) Design education	Design education development and practice
	Design culture research		Design education research
(BC2) Design planning and execution	Design management and strategy	(BC7) Design theory	Basic theories and methods
	Design methods and procedures		Design thinking and innovation
(BC3) Introduction to foreign design	Industry development	(BC8) Design technology	Theories and applications of intelligent technology
	Design education		Space and planning design research
	Character event		Digital media and design
(BC4) Design industry development research	Regional design research	(BC9) Perception and preference research	Principles and applications of human-factor engineering
	Industry development research		Imagery and preference research
(BC5) Social service design	Service design issues		
	Environmental and social issues		

In order to ensure the reliability of the categorization work, this study tested the reliability using inter-rater reliability and took the Cohen's kappa coefficients as a measure of reliability [62–64]. The 273 minor sub-topic categories were coded as SC1–SC273, the 21 middle sub-topic categories were coded as MC1–MC21, and the 9 major sub-topic categories were coded as BC1–BC9. The reliability of minor sub-topic category coding by the two researchers is shown in Table 5. The reliability of middle sub-topic category coding by the three experts is 0.813, and the reliability of major sub-topic category coding by the three experts is 0.511. All values are greater than 0.5, indicating that the reliability of the coding is within an acceptable range.

Table 5. Reliability of sub-topic category coding by two researchers.

	SC1–14	SC15–41	SC42–57	SC58–61	SC62–85	SC86–104
Cohen's kappa	0.954	0.674	0.861	0.556	0.541	0.774
p-value	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000
	SC105–118	**SC119–142**	**SC143–150**	**SC151–167**	**SC168–181**	
Cohen's kappa	0.649	0.566	0.809	0.669	0.876	
p-value	<0.000	<0.000	<0.000	<0.000	<0.000	
	SC182–200	**SC201–215**	**SC216–225**	**SC226–237**	**SC238–242**	
Cohen's kappa	0.508	0.619	0.502	0.543	0.500	
p-value	<0.000	<0.000	<0.000	<0.000	<0.000	
	SC243–249	**SC250–252**	**SC253–260**	**SC261–264**	**SC265–273**	
Cohen's kappa	0.744	0.947	0.855	0.686	0.757	
p-value	<0.000	<0.000	<0.000	<0.000	<0.000	

4. Results

This section is divided into four parts: first, the division of the 60-year-long design development trend into years using the text K-means++ algorithm; second, the study of the evolution of theme throughout all periods; third, the study of the trend of diversity of themes throughout all periods via SDI; and fourth, the exploration of the sustainable design context of all periods using LDA.

4.1. Chronology of Design Research

It is necessary to divide the periods into stages so as to explore whether Taiwanese design research motifs show a noticeable difference through different periods. The encoded data first collected the keywords in articles by year and used the text K-means++ algorithm for clustering and visualized processing. Principal component analysis (PCA) was applied to reduce the dimensionality. The multi-dimensional data were converted into a low-dimensional space, so as to display the research subject in a more distinct way. Figure 4 shows the visualization of the clustering results.

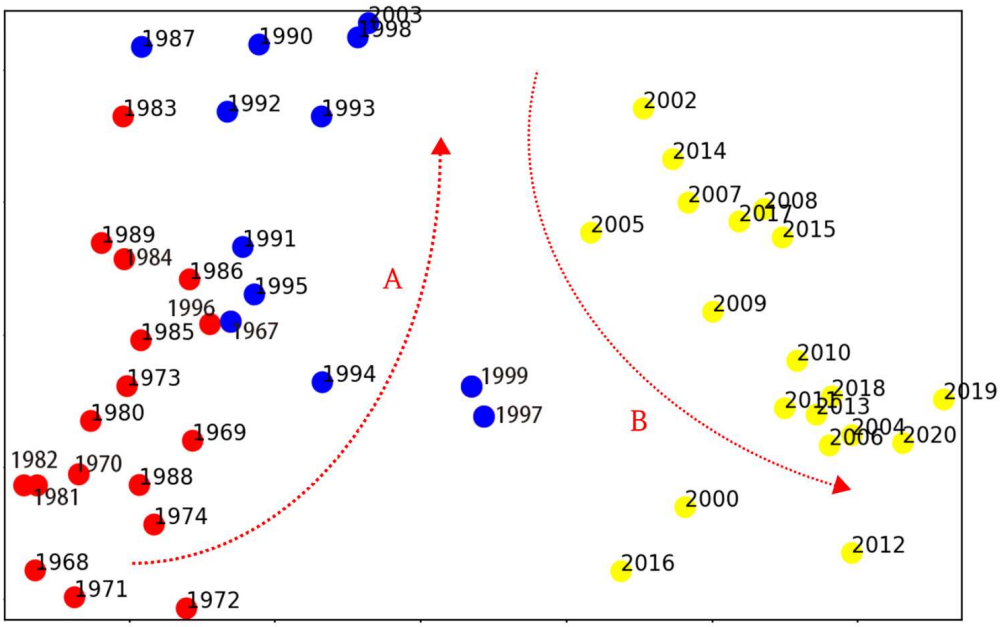

Figure 4. Matrix position of three clusters.

The results show that with the evolution of time, the chronological stage of the design field can be divided into three stages: in the first stage (1960s–1980s), the years corresponding to the red dots are y68–y90, y95, and y96; in the second stage (1990s), the years corresponding to the blue dots are y67, y91–y94, y97–y99, y03, and y05; in the third stage (2000s–2020), the years corresponding to the yellow dots are y00, y02, y04, and y06–y20. Among them, "y68" means 1968, "y91–y94" means 1991–1994, and so on, in a similar fashion.

4.2. Main Design Motifs at Each Stage

For the purpose of gaining a clearer understanding of the research topics and directions at the three stages, the categorization according to topic areas led to the results shown in Table 6, and Figure 5 shows the changes in the proportion of research on each topic. It can be seen from Table 6 that at the first stage (1960s–1980s), there was a total of 681 articles, of which "design planning and strategy" was the main topic (27.0%), followed by "introduction to foreign design" (20.6%). The third was "design theory" (18.0%). At the second stage (1990s), there was a total of 245 articles, of which "design theory" was the main topic (18.4%), followed by "design communication and practical research" (18.0%), and then "design technology" (13.5%). At the third stage (2000s–2020), there was a total of 494 articles; "perception and preference research" was the main topic at this stage (31.0%), followed by "design technology" (17.4%), and then "design planning and strategy" (16.6%).

Table 6. Main research topics at three stages.

	First Stage (1960s–1980s)		**Second Stage (1990s)**		**Third Stage (2000s–2020)**	
Design communication and practical research	101	14.8%	44	18.0%	79	16.0%
Perception and preference research	41	6.0%	32	13.1%	153	31.0%
Design technology	45	6.6%	33	13.5%	86	17.4%
Design theory	123	18.0%	45	18.4%	34	6.9%
Design education	26	3.8%	24	9.8%	29	5.9%
Design planning and strategy	184	27.0%	31	12.7%	82	16.6%
Social service design	6	0.9%	8	3.2%	12	2.4%
Design industry development research	15	2.2%	6	2.4%	16	3.2%
Introduction to foreign design	140	20.6%	22	9.0%	3	0.6%
Total	681	100%	245	100%	494	100%

The above-mentioned data were made into a visual chart, as shown in Figure 5. The topics that continued to rise at the three stages are "perception and preference research", "design technology", and "design industry development research". The topic "introduction to foreign design" continued to decline. Education on design had a noticeable decline at the third stage.

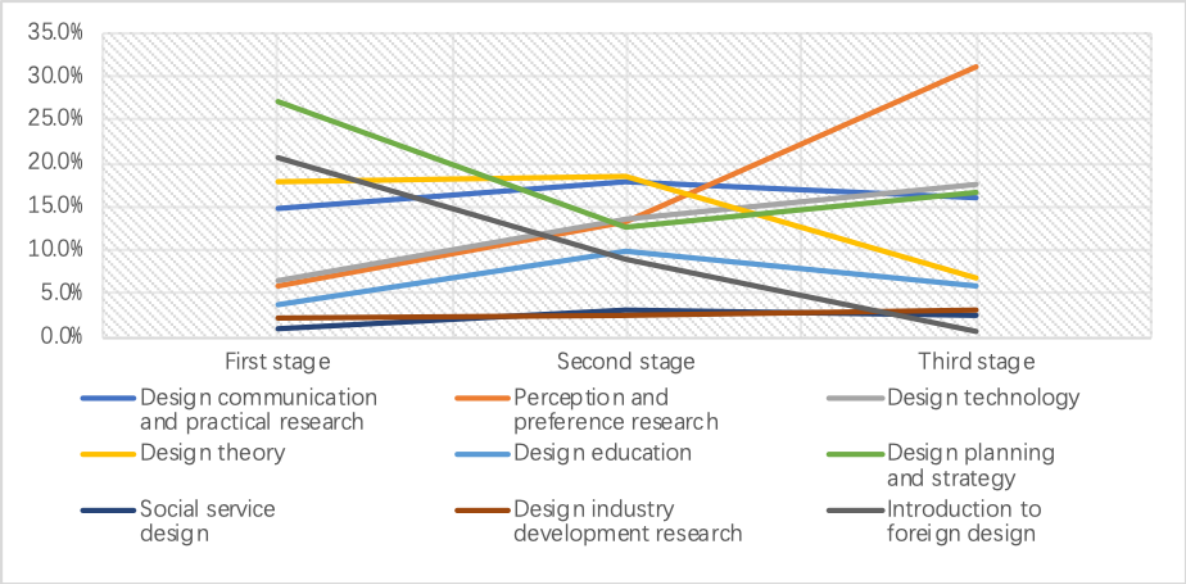

Figure 5. Changes in the proportions of research in various areas at three stages.

4.3. The Study of the General Trend of the Design Context

In order to analyze the overall trend of design motifs, the keywords for the above-mentioned three stages were sorted to select the top 20 terms based on the TF-IDF value (Figure 6). The TF-IDF values of keywords in text contents from *Industrial Design* at each stage were analyzed to detect the key vocabulary of each stage.

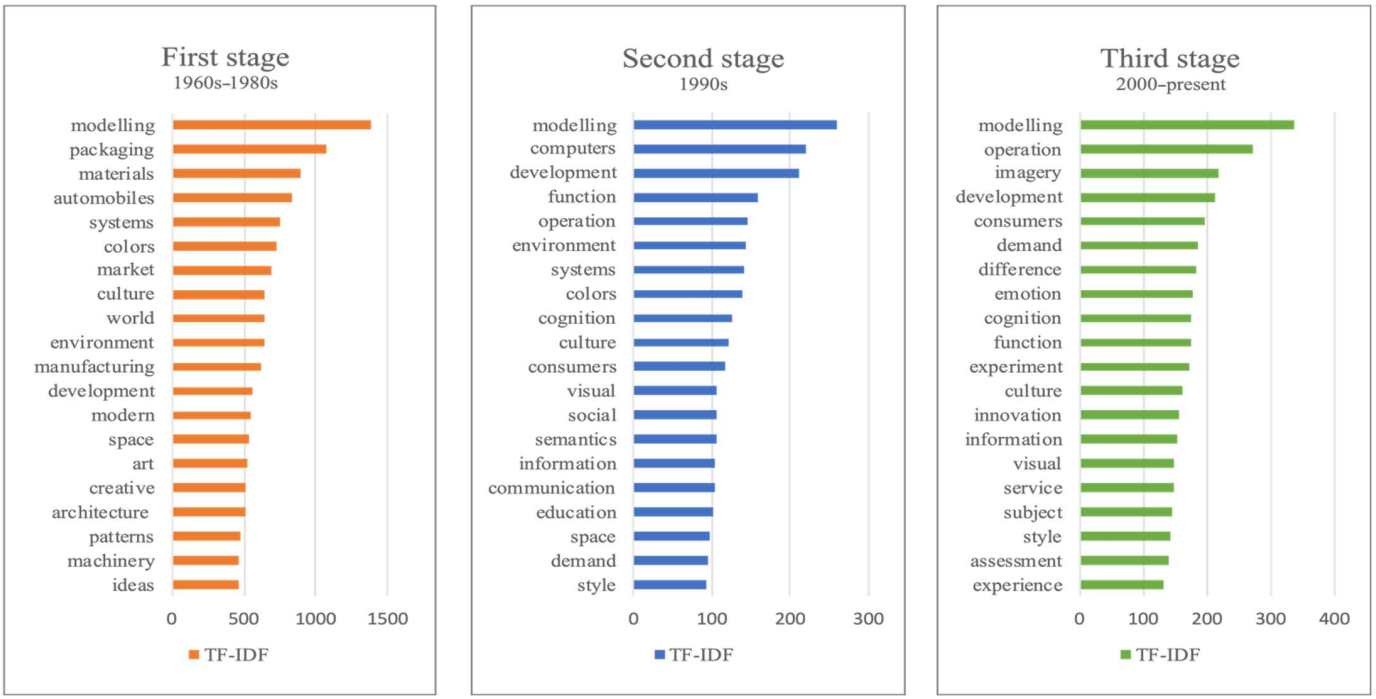

Figure 6. Keyword TF-IDF value ranking at three stages.

According to Figure 4, we may find two changing trends: Trend A (1967–2003) and Trend B (2002–2020). For a further analysis of original differences, a difference comparison was performed on research topics between the starting and ending groups of the two trends. The starting and ending groups of Trend A were defined as (y68, y71, y72) and (y90, y98, y03), respectively, while the starting and ending groups of Trend B were (y02, y05, y07)

and (y18, y19, y20), respectively. We calculated the difference between the total number of papers in the ending group and the total number of papers in the starting group. The results are shown in Table 7. The larger the value of the difference in the table is, the greater the influence of this topic on the trend will be. The positive and negative numbers indicate whether the number of papers on the topic increased or decreased in the trend.

Table 7. Main evolutionary driving forces of Trends A and B.

		Trend A (1967–2003)			Trend B (2002–2020)		
		Research Topic	**Category**		**Research Topic**	**Category**	
Based on downtrend	1	Design methods and procedures	Design planning and execution	−21	Imagery and preference research	Perception and preference research	−6
	2	Character event	Introduction to foreign design	−14	Digital media and design	Design technology	−5
	3	Basic theories and methods	Design theory	−13	Design culture research	Design communication and practical research	−4
Based on ascending difference	1	Principles and applications of human factors engineering	Perception and preference research	+5	Regional design research	Design industry development	+2
	2	Theories and applications of intelligent technology	Design technology	+1	Theories and applications of intelligent technology	Design technology	+1
	3	Design education research	Design education	+1	Design education research	Design education	+1
					Design methods and procedures	Design planning and execution category	+1

4.4. Diversity of the Study on Design

It is observed from the history of the study on design that design is an integrated application discipline, with numerous theories taken from other fields to explain issues in the field of design, which leads to a greater level of diversity of the study on design. Greater diversity boosts innovative study instead of restricting it to the existing frame. However, this extra diversity can lead to extra divergency and loss of focus regarding fields. As diversity can reflect the state of the fields themselves, the study of diversity bears significant value [65].

To explore the evolution trend of diversity of the previous studies on design, this study measured the diversity using quantized metrics, namely, SDI, which is extensively used in ecology. It can be used to measure the level of diversity in an enclosed system. It mainly utilizes pi, the proportion of the individual number of different categories in the system, to measure the diversity within the system with ($D = \sum pi^2$) and ($1/D$) [66]. The system's complexity and level of diversity grow as SDI increases. In this study, design is considered as a system. The main textual content is divided into nine major sub-topics to calculate pi for nine major sub-topics. The diversity index of design study topics for each year can be determined using SDI (Figure 7). In order to verify if it is a noticeable trend, this study aims to validate the integrating degree using regression analysis, with $R^2 = 0.375$ and sig = 0.008 ** ($p < 0.01$). It is statistically significant with respect to the trend.

4.5. The Sustainability of the Study on Design

In order to explore the sustainable theme in the literature of an unstructured enormous quantity, the LDA used in this study is an effective solution [67]. LDA serves as a non-supervision machine learning algorithm. As there is no need to label documents in advance, analysis can be performed relatively independently of a human's prior judgments. It has

been widely used as a technique for analyzing recent academic trends, as it is useful for finding hidden topics in the literature. Among several algorithms of topic modeling, LDA is widely used as a representative probabilistic topic model [68].

According to the broad concept of sustainable development and sustainable theme category [67,69,70], first, the analysis of frequent vocabularies was carried out on 1420 pieces of text using TF-IDF. The first 10% of vocabularies based on TF-IDF in each text were used to represent the key purport of that text. Thus, the themes with the first three weights of three stages, the first 10 words of each theme, and the proportion of that theme in the entire terminology database are to be exported by running LDA. However, the researchers should mark and name the theme and divide the research subject; the results are shown in Table 8.

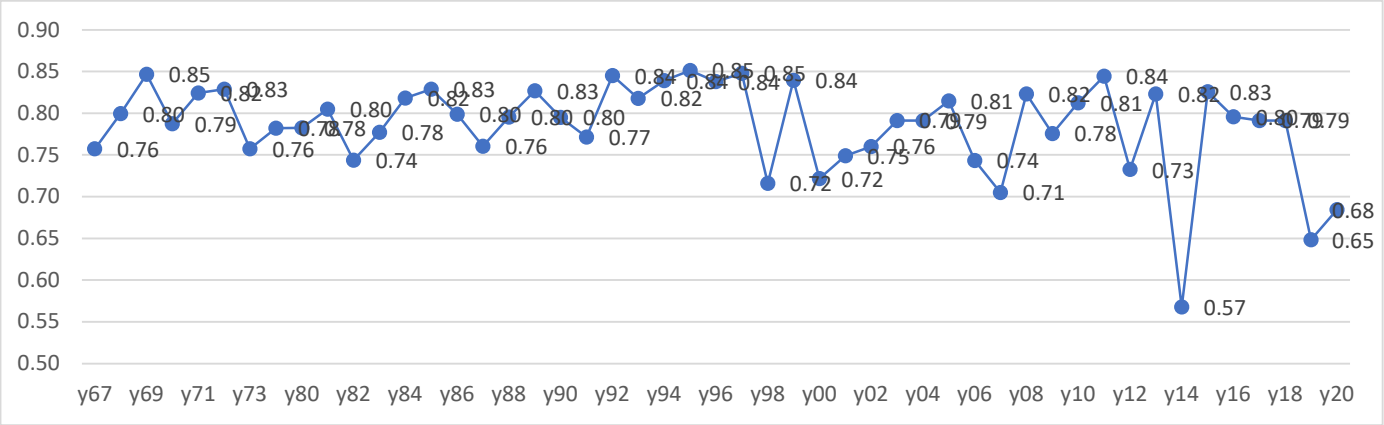

Figure 7. The evolution trend of the diversity index.

Table 8. Identified topics from the LDA.

	Topic	Top 10 Relevant Words	Share
		The first stage (1960s–1980s)	
1	IT and finance for sustainability	Packing, commodity, industry, Japan, appliance, lighting, automobile, material, market, printing	0.022
2	Sustainable marketing	Enterprises, model, symbols, issues, methods, society, cooperation, packing, commodity, activities	0.021
3	Education for sustainability	Education, plastics, space, students, buildings, life, craftsmanship, centers, materials, lectures	0.020
		The second stage (1990s)	
1	Sustainable consumer behavior	Consumers, enterprises, transmission, positioning, products, special cases, technology, man-making, pictographic, bionic	0.030
2	Education for sustainability	Education, ecology, experts, basics, special topics, situation, products, style, lessons, users	0.028
3	Sustainable marketing	Users, selection, management, operation interfaces, toilets, recycling, quality, dismantling, waste, system	0.028
		The third stage (2000s–2020)	
1	Sustainable community	Image, sensation, culture, evaluation, preference, personality, display, enterprises, model, picture books	0.021
2	Sustainable communication	Interface, users, operation, games, websites, ads, social community, function, experience, software	0.021
3	Sustainable development	Users, network, tribes, mobile phones, phubbers, sensation, the old, culture, factors, clients	0.020

5. Discussion

In this section, the paper explores Taiwan's design history from the 1960s to 2020 based on the evolution of theme, diversity, and sustainability. It can be seen from the clustering results that the design topics in Taiwan can be divided into three stages, namely, the 1960s–1980s, the 1990s, and the 2000s to 2020.

5.1. The Analysis of Evolution of Design Themes

According to the changes in the proportion of research topics at each stage (Figure 5) and the keyword TF-IDF values (Figure 6), a dimensional construction was made for the major sub-topics, corresponding to the category contents of the middle and minor sub-topics of each major sub-topic (Appendix A), for the following analysis:

In terms of the key themes for each stage, first, in the 1960s–1980s, design motifs mainly included "design planning and strategy", "introduction to foreign design", and "design theory". It can be seen that the focus of design motifs was on the research and development of materials and technology, the popularization of basic theories, and the introduction of foreign design trends. Second, in the 1990s, the design motifs were mainly "design theory", "design communication and practical research", and "design technology". This shows that the focus of design motifs was on the interpretation of multiculturalism, the integration of digital design, and the communication of design aesthetics. Huang et al. also came to this conclusion in their research; they point out that that from 1996 to 2004, the most popular research topics in Taiwan's *Journal of Design* articles were design culture research, methods and strategies, and digital media and other themes [30]. Third, since the beginning of the 21st century, design motifs have been mainly categorized as "perception and preference research", "design technology", and "design planning and strategy", with technology integration and development in the design field; emotional human factors designs based on intelligent technology were the main issue of this period. Shih et al. also delivered the same results in their study [41].

In terms of upward and downward trends (Table 7), three topics that have continued to rise are "perception and preference research", "design technology", and "design industry development research", while the topic "introduction to foreign design" has continued to decline. According to the analysis, the middle and minor sub-topics that have continued to rise mainly include imagery and preference cognition, human factors analysis, scientific and technological theories and applications, industrial trends, localized design, and other related topics, which shows that the overall current design motifs are directed towards intelligent technology, emotional human factors, and localized culture as a whole, while the contents that have continued to decline include foreign design industry development, design education, and institutional competitions, which shows the importance of improving the integration of intelligent technologies, Kansei engineering, and other directions in the field of design education. However, these results are also consistent with those of Chao et al. [70].

In terms of the entire trend and driving forces, in Figure 5, it was found that there are two development trends: Trend A (1967–2003) and Trend B (2002–2020). In combination with Table 7 and middle sub-topics: in Trend A, "emotional human factors" and "digital technology" were the main driving forces for the evolution of design motifs from the 1960s to the 1990s, and in Trend B, "intelligent technology" and "local culture" were the main driving forces for the evolution of design motifs from the 2000s to 2020. Among the current driving forces, "intelligent technology" shows technology integrated with design across fields, and "local culture" is the competitiveness of the design culture. This trend also affirms the opinions of Shan et al. (2002) that "differentiation" based on "regionalization" has been the core of design development since the start of the 21st century [33]. These two directions are not only the main driving forces of the current trends of design motifs in Taiwan, but should also be considered to affect the future trends of design motifs. They can be regarded as a pilot balloon for design research.

5.2. The Trend of Diversity Index of Design Themes

It can be seen in Figure 7 that the rapid change in and diversity of study themes came as an anticipated, inevitable outcome of the influence of the beginning of, growth by, and frequent changes in design fields in the first stage (1960s–1980s); the index was on the rise as a whole during the second stage (1990s), which shows that design fields became wider with more diversified points of view; in the third stage (2000s–2020), the rising trend during the 1990s continued throughout the 2000–2006 period. Subsequently, acute fluctuations occurred. The analysis above, in combination with the topics mentioned, shows that more diversified points of view were born with VR and AI, and other technologies were incorporated into design after 2006. Thus, the diversity during this period rose through fluctuations. In addition, the index has been on a decline as a whole in recent years, which indicates that design may have become an independent and mature field, dedicated to a study theme such as smart technology or local culture.

It is certain that a higher level of diversity presents the existence of diversified points of view, which can constantly provide ways to think about issues from varied points of view [65]. In recent years, the declining diversity hints that current design needs to be stimulated by external environmental variations. All these are issues that should be discussed in subsequent studies.

5.3. The Development Trend of Sustainable Design

Since the mid-20th century, design has served as a major function of business innovation and been engaged in different aspects of sustainability discussions and practices in government and local communities [71–73]. Design has been recognized in the literature as a catalyst to move away from the traditional take–make–dispose model to achieve a more restorative, regenerative, and circular economy [74,75]; this study explored the trend of regional sustainable design by means of the development context of Taiwanese design.

As shown by the relevant vocabularies in Table 8, it was found that "IT and finance for sustainability", "sustainable marketing", and "education for sustainability" were comparatively important sustainable design directions during the 1960s–1980s. It can be seen that sustainable design was focused on technology, the market, and education at the beginning of the design era. This conclusion is also reflected in the global sustainability design trend in this period, and the relations among resource constraints, design technology, material production, and the environment are also among the key issues [76,77]. In the 1980s, the United Nations (UN) declared the importance of education for sustainable development and proposed a transition to green design and sustainable lifestyles [78–80].

As design moved towards a human-oriented nature in the 1990s, "sustainable consumer behavior" became important at this stage. However, compared to the last stage, "education for sustainability" was on the rise. The content of education shifted from the technology and methodology of the last stage to situation, style, and other design trends. Then, "sustainable marketing" moved to third place in order of importance. The vocabulary frequency shows that there was an awareness of sustainability at the stage of design in the market, such as the recycling, dismantling, and treatment of wastes. It can be seen from this stage that sustainable design was focused on consumers' behaviors and experience, as well as environmentally friendly design. During this period, global sustainability design also discussed the impact of the way consumers interact with products on the environment [15,81,82]; the proposal of green design, ecological design, and other approaches [83,84]; and enabling product personalization [85], designing products that age with dignity' [86], and other proposals of emotionally durable design [87]. It can be seen that during this period, Taiwan was relatively in line with the global sustainability design trend.

Since the beginning of the 21st century, "sustainable community"," sustainable communication", and "sustainable development" have become comparatively important sustainable design directions. With the interdisciplinary development of smart technology in design, it is often mentioned in terms of interfaces, social communities, preferences, etc. It

can be seen from this stage that integrating smart technology and local culture into Kansei engineering stands at the center of sustainable design. During this period, localization is also a hot topic for the global sustainable design issue. Cultural, social, and personal factors can have an important impact on design [88–90], as well as community development and enabling community members to express their opinions in design thinking [91] and explore sustainable concepts based on localized technology and recycled living in design education [92].

In sum, since the 1960s, sustainability design issues in Taiwan have gradually expanded from a focus on technology and products to large-scale system-level changes, such as consumer behavior, emotional design, and localization and technological innovation since the start of the 21st century. Such development is also consistent with the development of global sustainable design [87].

6. Conclusions and Suggestions

Compared with previous research into the main design topics, this paper attempts to categorize the development of modern design topics in Taiwan using a more complete journal text collection in order to explore the evolution of theme, diversity, and sustainable design trends in a historical context. It is shown by the clustering results that design topics in Taiwan can be divided into three stages, namely, the 1960s–1980s, the 1990s, and the 2000s–2020.

Regarding the evolution of theme, the research topics of these three stages became significantly different from one another over time. First, from approximately the 1960s to the 1980s, the design topics were focused on the research and development of materials and technologies, the popularization of basic theories, and the introduction of foreign design trends. Second, in the 1990s, the focus of design topics was on the interpretation of multiculturalism, the integration of digital design, and the communication of design aesthetics. Third, the focus of design topics in this period was on methods and procedures based on intelligent technology, emotional human factors, and local culture. The decline of design education indicates its potential to improve the integration of smart technologies and other hot topics across fields. Taiwan has shown two evolutionary trends since the development of modern design in the 1960s, namely, Trend A (1967–2003), which comprises "emotional human factors" and "digital technology", and Trend B (2002–2020), which comprises "local culture" and "intelligent technology".

Regarding diversity, design themes were subject to rapid changes and a higher level of diversity at the beginning of the design era during the 1960s–1980s. In the 1990s, design themes were on the rise as a whole in terms of diversity. This shows that design has been incorporated into Kansei engineering, digital technology, and other fields; from 2000 to 2020, the diversity of design themes was subject to rapid changes with the rise of smart technology, local culture, and other topics. In recent years, diversity has begun to drop, indicating that current design requires stimulation through external environmental variations, which warrants further investigation in subsequent research.

Regarding the trend of sustainable design, it was focused on technology, the market, and education from approximately the 1960s to the 1980s; it was focused on human factors and experience design centered on consumers in the 1990s, with design education's direction centering on situation and style. Furthermore, emphasis was placed on eco-design, as well as the integration of smart technology, local culture, and Kansei engineering across fields during the 2000–2020 period.

This study makes the following contributions: For industrial applications, it can help companies understand the current design situation and predict future trends; from a theoretical perspective, the results of this research can help academic researchers understand the research trends shown in the design field and then determine current and future potential research directions; it can also aid researchers in exploring further possibilities of research methodologies in regional design and supplementing the Chinese design context aim using the diversity of global design history; in the context of sustainability, such exploration

will not only help to establish the history of regional sustainable design, but also explore the development direction of sustainable and mutualistic growth of design and regional resources based on the historical context. For the purpose of future research recommendations, horizontal comparisons may be made between the design development contexts in Taiwan and other regions or countries to enable researchers to investigate the differences between Taiwan and the international design context, which contributes to analyzing the development of design topics in regions from a multi-dimensional perspective.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. List of Major, Middle, and Minor Sub-topics Involved in Articles of *Industrial Design*.

Research Topic Category		Research Area
Major Sub-Topics	**Middle Sub-Topics**	**Minor Sub-Topics**
BC1: Design planning and execution	MC1: Design methods and procedures	SC1–14: Material and technology, product design case introduction, photography technology, lighting design, toy design, illustration design, information technology, automotive design, laser technology, electromechanical system, product development, innovative technology, styling design, modular design
	MC2: Design management and strategy	SC15–41: Design strategy, design procedure, design management, intellectual property, design evaluation, market analysis, design application, development and cost, project analysis, design evaluation, design performance, design contract, design patent, business merger, system design method, product cycle, review system, design standards, market pricing, design department, product evaluation model, diversified marketing, product planning, design resources, design communication, corporate social responsibility, interview skills

Table A1. *Cont.*

Research Topic Category		Research Area
Major Sub-Topics	**Middle Sub-Topics**	**Minor Sub-Topics**
BC2: Design communication and practical research	MC3: Design culture research	SC42–57: Color physical research, crafts, craft seminars, design style, design history, theme connotation, modeling art, aesthetics, multiculturalism, regional cultural differences, regional design history, model meaning and essence, ethnic culture, local characteristics of culture industry, rationality and sensibility, design aesthetics
	MC4: Issues for disadvantaged groups	SC58–61: Issues such as aging, people with disabilities, children, women, etc.
	MC5: Visual practice design and application	SC62–85: Visual communication, advertising, text and layout design, symbols, images, illustrations, fonts, visual design case introduction, packaging design, ID case analysis, cross-domain visual design, pointer design, corporate identification system, CI strategy, composition, pattern, expression technique, icon, CIS design, parameterization, cross-domain academic theory, perspective drawing method, brand image, brand awareness
BC3: Perception and preference research	MC6: Imagery and preference research	SC86–104: Modeling psychology, visual psychology, color perception, product image, preference, host and guest psychology, design semantics, consumer demand, usage context, consumer life style, demand pattern, style image, institutional experience, pleasant design, user evaluation, consumer experience, emotional design, interactive design, experience design
	MC7: Principles and applications of human factors engineering	SC105–118: Engineering concepts, cognitive research, identification, behavioral science, anatomy, physiology, cognitive psychology, human factors engineering, human factors analysis, Kansei engineering, visual cognition, auditory cognition, creative cognition, perceptual image
BC4: Design theory	MC8: Design thinking and innovation	SC119–142: Design conception, design philosophy, creativity, visual communication thinking, designer interviews, design experience, design trends, differences between east and west ideas, design performance, automotive industry, design concepts, role concepts, design concepts, design inspiration, design Analysis, design method, design language, theoretical model, design meaning, design literacy, serialized design, universal design, Zen idea, integrated design
	MC9: Basic theories and methods	SC143–150: Basic design theory, popularization of design concepts, design research methods, design guidelines, questionnaires, design plans, cross-domain theory, academic architecture
BC5: Design technology	MC10: Theories and applications of intelligent technology	SC151–167: Neural network, virtual technology, human-machine environment system, projection system, robot system, information processing system, video on-demand system, electric bicycle design, cross-domain design, virtual design, portable electronic products, intelligent recommendation system, eyeball tracking, forward-looking technology, artificial intelligence, animation design, platform development
	MC11: Digital media and design	SC168–181: Web design, digital issues, Internet, automation, software applications, interface design, digital design method, computer-aided design, digital history, multimedia tools, new media art, digital development trends, 3D animation, information design
	MC12: Space and planning design	SC182–200: Space design concept, thinking, architectural space design, spanning design, furniture design, living environment, exhibition design, exposition, support organization, transportation space design, display system, three-dimensional, future theme, three-dimensional modeling, three-dimensional image, online games, urban street scenes, spatial landscapes

Table A1. *Cont.*

Research Topic Category		Research Area
Major Sub-Topics	**Middle Sub-Topics**	**Minor Sub-Topics**
BC6: Design education	MC13: Design education research	SC201–215: Design education seminars, educational thinking, new ideas, theme design, industry-university cooperation, educational methods, school-running models, educational concepts, educational analysis, design educational history, teaching principles and methods, educational management and innovation, design teams, evaluation system, cross-domain cooperation
	MC14: Design education development and practice	SC216–225: Curriculum research, graduation production exhibition, school status, design teaching method, design competition, teaching achievement exhibition, subject theory, Internet, software teaching, practical teaching
BC7: Social service design	MC15: Environmental and social issues	SC226–237: Bionic design concept, environmental design, natural energy, power source, ecological analysis, green design, sustainable issues, environmentally friendly materials, green design seminars, environmental product development, green design evaluation, sustainable design
	MC16: Service design issues	SC238–242: Designer rights, customer participation in design, consumer participation in design, service design, co-design
BC8: Design industry development research	MC17: Industry development research	SC243–249: Industrial development trends, design associations, design exhibitions, design competitions, seminars, product design weeks, design agencies
	MC18: Regional design research	SC250–252: Localization issues, community design, local resources
BC9: Introduction to foreign design	MC19: Industry trends	SC253–260: Industrial development, case analysis, product introduction, design agency, design concept, design policy, design industry development history, design yearbook
	MC20: Design education	SC261–264: Foreign design education, curriculum analysis, design school, craft education
	MC21: Character event	SC265–273: Designers, design groups, fairs, international design associations, design competitions, design sports, foundations, works exhibitions, travel notes

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How Design Technology Improves the Sustainability of Intangible Cultural Heritage Products: A Practical Study on Bamboo Basketry Craft

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Abstract: The sustainability problem of many intangible cultural heritage (ICH) products stems from the shrinking of the core practitioner group, which is also the case for bamboo basketry craft. We believe that the problem in bamboo basketry originated in the lack of labor division between design and manufacturing, which prevents professional designers from entering this industry and results in the absence of several key stakeholders related to innovation and R&D. The lack of labor division is due to the technical difficulties associated with expressing the design concepts. The complexity of basket weaving structures makes it difficult to communicate between designer and manufacturer without precise expression tools, thus binding design and manufacturing into an integrated role. Guided by the user innovation theory, our team studied the design technology of bamboo basketry and developed a series of aiding tools, including the modeling of basic over–under structures and free weaving structures, automatic mapping techniques from 2D to 3D and several frequently used weaving skills, such as connecting, wrapping, plaiting and knotting. This technology enables designers to quickly design and express weaving structures with full details in digital models rather than to make samples. The application of the software shows that the technology considerably improved the designer interest and confidence. This technical solution makes designers, rather than programmers, able to do the development work, which also helps to create a sustainable ecological environment of technological research, also avoiding the difficulties associated with attracting business investment for such niche demands in the starting stage. Our practice shows that the sustainability of ICH products and the sustainability of the industry are closely related and that solving the latter supports the former.

Keywords: intangible cultural heritage; sustainability; design technology; bamboo basketry craft

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1. Introduction

Bamboo basketry craft is one of China's intangible cultural heritages (ICHs) and was added to the protected national ICH list issued by the Ministry of Culture of China in 2006 in the category of Traditional Art (number 350VII-51).

Bamboo basketry craft is widely distributed in southern regions of China, such as Zhejiang, Hunan, Sichuan, Guangxi and Fujian. Bamboo grows fast and requires little conservation. In some areas, its excessive spread has threatened the growth of other plants, endowing bamboo with considerable sustainable use value. The manufacturing methods of bamboo basketry products are rather primitive, and in some bamboo resource areas (mostly in rural areas), the leisure time of residents is often used as a supplement for labor [1]. Some companies have set up factories in remote bamboo resources areas as a response the Chinese government's poverty alleviation plan and rural revitalization plan [2] and have achieved win–win situations.

Bamboo is an elegant plant in traditional Chinese culture and is often the subject of poetry and painting. Bamboo basketry products are exquisite in structure and rich

in detail. They are loved by the public, with a strong user base. Backed by a profound cultural background, they have considerable potential to contribute to the sustainability of traditional culture and local economies [3,4]. However, the survival of bamboo basketry in modern society is a complex problem posing challenges for many years. Regions in China that are rich in bamboo resources (such as Anji in Zhejiang Province) have developed bamboo products such as bamboo floor, bamboo charcoal and even bamboo beverages [5,6] by deep processing, achieving positive economic benefits. However, in terms of cultural heritage, the continuous decline of bamboo basketry craft is undesirable.

Our research focuses on the technical requirements of bamboo basketry products in terms of sustainability. According to the premise of maintaining the traditional handcraft manufacturing method (which is difficult to replace with machines [7]), we attempt to enable professional designers to engage in basket design with technical assistance, accounting for complex structural details. In this paper, we present our technical development and application, in an attempt to try to resolve issues in the production processes of traditional basket weaving.

2. Literature Review

2.1. Bamboo Basketry Product Industry of China

Bamboo basketry products are popular in China, Japan and other Southeast Asian countries. According to the *2020 China Bamboo Cultivation and Industry Development Report* released by the Development Research Center of National Forestry and Grassland Administration of China [8,9], by the end of 2020, the area of bamboo resources in China had reached 791.42 million hm. Two main types of bamboo species are used for basketry: Moso bamboo in the central and southeastern areas and Sinocalamus affinis in the southwest and southern areas; Moso bamboo accounts for 61% of the total bamboo resources in China [10].

There are 19,754 bamboo production and processing enterprises in China, including 18,338 small and micro enterprises, 1320 medium enterprises and 79 large enterprises. The total number of employees in the bamboo industry is 15.82 million, among which 13.93 million are farmers, accounting for 88.08% of the bamboo workforce. By the end of 2020, the output value of the industry reached RMB 31.99 billion, including RMB 8.22 billion in primary industry, RMB 16.48 billion in secondary industry and RMB 6.81 billion in tertiary industry [9]. According to the *2020 China Bamboo and Rattan Commodity International Trade Report* [11] released by the International Bamboo and Rattan Organization (INBAR), in 2020, China's total export trade of bamboo products totaled USD 2200 million, of which woven bamboo products accounted for about 14%, representing the second largest category following bamboo tableware (42%).

Many types of bamboo basketry products are manufactured in China, but innovative designs are rare, as indicated by many research reports in regions with rich bamboo resources [12]. For example, the area of bamboo forest in Zhejiang Province accounts for about 11% of China's total bamboo resources, but the types of bamboo basketry products manufactured in this region are similar to those made half a century ago [13]. Qingshen, a small town in Sichuan Province, is home to a style of bamboo basketry that is famous in China; however, due to a lack innovation, recently developed products involve copying images with finely split bamboo sticks, resulting increased prices and costs. Thus, production is limited, as are the market and user group [14]. The shortage of designers is considered to be the main reason for most problems in the bamboo weaving industry [15], resulting in an industry that is seriously out of touch with the market, failing to cater to or guide user needs.

The production of basketry is primitive and complex [16], involving about 30 processes and more than 10 kinds of homemade tools. The process is not clearly divided [17], and for most products, all manufacturing work is done by one or two people [18]. The average age of bamboo craftsmen is high, especially the craftsmen officially identified as outstanding inheritance keepers. In order to protect ICH, the Chinese government has funded selected inheritors to practice the craft and ensure its prosperity. The main problem associated with

this inheritance method is that designs and skills can only be passed through products, dictation and demonstration, which is an inefficient means of transmission [19,20].

2.2. Study on Basketry

Basketry a craft constituting the manufacture of products from bamboo, rattan, willow, grass and other plant materials based on weaving techniques involving complex structures developed over hundreds of years. Many related discussions have occurred in the field of anthropology through cultural observation.

Meilach [21] summarized and classified the structures of various basketry products, and divided them into four basic categories: weaving, plaiting, twining and coiling. Law [22] studied traditional white oak basketry in the areas of the central Appalachian Mountains and traced the origin of the product shapes and structural features, the style differences between regions, artisans' views on this traditional skill, etc. McGuire [23] investigated Shaker baskets made with materials similar to bamboo. As twilling is the most commonly used basket-weaving skill, LaPlantz [24] systematically studied the structural features manufacturing techniques of twilled baskets. Sentence [25] summarized 16 basic types of basket materials in his encyclopedic book, as well as the weaving techniques associated with each material.

2.3. Study on Bamboo Weaving Skills

Research on bamboo weaving skills has mainly been conducted in China and Japan. Japanese bamboo basketry was derived from China, gradually evolving from functional products to fine art, such as sculpture, representing a unique form of modern art. The Asian Art Museum in San Francisco preserves more than 900 pieces of Japanese bamboo baskets donated by Lloyd Cotsen, which have been the object of numerous studies. Moroyama [26] considered 74 baskets in a review of the development of Japanese bamboo basketry over the 150 years from the Meiji period to modern times. Rinne [27] conducted a thorough study on the working style, living status and teacher–student relationships of the craftsmen in Japan and provided a list of typical skills of Japanese bamboo basketry. Coffland [28] conducted an analysis of the development path of Japanese bamboo basketry, from early Chinese-inspired craft to the eventual development of modern Japanese woven sculpture. It is believed that the disillusion of China's cultural idol status in Japan about 1000 years ago indirectly led to the separation of Japanese bamboo art styles from Chinese practice. Earle [29] focused on modern bamboo basketry in Japan after the new millennium, reporting the trend of Japanese bamboo basketry approaching sculpture art, even borrowed the name of bamboo sculpture.

Laufer [30] introduced Chinese bamboo basketry and compared its practice with the traditional plant-weaving skills practiced by North American Indians, as well as in the Philippines, Hawaii and New Zealand. Zhang [31] reported on bamboo classification and material properties, categorizing bamboo basketry styles in different parts of China. He also compiled a list of commonly used Chinese bamboo weaving skills and 40 typical structures. Xu Huadang [32] conducted a detailed study on fine bamboo weaving crafts in Zhejiang, which to some extent, represent the value orientation of modern Chinese bamboo basketry. Zhang [33] conducted a comparative study on bamboo basketry styles in modern China and Japan, highlighting their differences. Liu [34] studied the form and technological innovation of modern Chinese baskets and discussed the possibility of applying traditional patterns in weaving structure innovation.

2.4. Development of Digital Design Techniques

At present, digital techniques are mainly applied in bamboo basketry for the purpose of demonstration, such as the Qingshen bamboo basketry digital platform [35,36] and the Mingdao bamboo basketry digital texture library [37], etc. Most digital platforms and databases focus on ICH protection and knowledge dissemination rather than promotion of innovative design [38].

The most important technical requirement for bamboo basket design is the automatic generation a large number of complex structures, whereas most CAD software does not provide such functions. Liu [39] developed an automated 3D modeling technology for orthogonal weaving structures for bamboo or rattan products, proposing a technique for mapping a black and white image into 3D weaving structures [40]. Zhang [41] proposed fast and interactive methods for intelligent 3D modeling of free weaving structures. Liu [42] developed rapid techniques to model non-circular strip cross section forms using bamboo materials. Wu [43] developed parametric modeling technology for 3D printing of bamboo baskets. Cao [44] developed a digital design system for bamboo baskets and realized the rapid modeling of basic basket types.

Grasshopper for Rhinoceros is one of the most commonly used development tools for weaving structure design, with which Jiang [45] and You [46] developed parametric modeling technology for basic weaving structures. Similar studies are occasionally published but with few new patterns developed. Some studies have investigated the design of baskets with intelligent technologies. Liu [47] generated innovative weaving patterns based on generative adversarial networks (GANs), and Wang [48] designed weaving patterns based on deep learning technology. Most of the designed objects are planar weaving patterns, whereas 3D smart modeling of weaving structures has rarely been reported.

2.5. User Innovation in Design Technology

Because bamboo basketry design technology has a relatively smaller user group and the profit is not sufficient to attract considerable investment, here, we adopt a user innovation strategy of open innovation for R&D.

Open innovation is a fifth-generation innovation mode of technological innovation [49]. The concept was proposed in 2003 by Chesbrough [50], who suggested that creative ideas can be obtained from both within and outside of a company. There are four modes of open innovation, namely user innovation, supplier innovation, inter-enterprise cooperative innovation and university–industry cooperative innovation [51]. The concept of user innovation proposed by Von Hippel refers to the innovation activities implemented by users, including new ideas, techniques, equipment, materials or processes [52].

Assistive tools are important factors for user innovation because many users have their own ideas, but not all users can express their ideas well. Von Hippel referred to the concept of a *user innovation toolbox* and outlined four characteristics [53–55]: (1) ability to get people to go through a series of cycles and then learn by doing; (2) friendly interface with low learning cost; (3) a variety of modules and components to enable users to focus on innovation work; and (4) information about the capabilities and limitations of the manufacturing system to ensure the feasibility of the user's solutions.

After years of research and practice, user innovation theory has been verified in many fields. Venesz conducted a systematic study on the characteristics of *leading users*, the main body of user innovation [56]. Fursov demonstrated the value of user innovation in a non-market environment and implementation methods through five product design cases [57]. Escobar studied the user innovation phenomenon in small- and medium-sized enterprises and investigated the correlation between innovation and entrepreneurship [58]. Keinz discussed the operational issues associated with user innovation through several cases [59].

The form of user innovation investigated in this paper is that of bamboo basket designers developing their own assistive design tools in the software with which they work. Most design software provides two kinds of secondary development interfaces: one is for professional programmers, using the VC++ platform as the main development tool, and the other is for users, using low-efficiency but easy learning tools, such as VBA [60] and scripts [61], or non-programming tools, such as Grasshopper for Rhinoceros [62] and ArduiBlock for Arduino [63] (a hardware design platform).

2.6. Summary

CAD technology is commonly used in ICH product design, most of which do not significantly differ from ordinary products. For example, the design tools for traditional art are basically the same as those for graphic design. However, bamboo basketry is an exception due to is rich 3D structural details, which are connected as a whole. The functions of common CAD software functions cannot solve this problem. Thus, the design method of bamboo baskets has not changed meaningfully over the years, whereas other ICH products, such as embroidery [64], paper cutting [65] and traditional patterns [66], have benefited from the achievements of modern technology.

Most literature studies of bamboo basketry design tools have focused on automatic modeling of basically cross woven structures, rarely exploring basketry patterns, such as Stout's Celtic interwoven pattern generated with 2D design tools [67]. The weaving skills necessary to make bamboo baskets very rich, involving dozens of high-quality exquisite structures [32], which seldom appear in the technical literature. Tools for innovation (not just for demonstration) remain in the initial stage of development.

Given the CAD platforms and their development tools (such as Grasshopper, VBA, etc.) used in the literature, most developers are designers rather than professional programmers. This is an important sign of user innovation. Research papers have been published on the bamboo basketry industry, but analysis of the long-term impact of design technology is lacking, possibly as a result of the immaturity of the associated technology.

3. Technical Requirements

3.1. Product Types

Bamboo basketry products can be roughly divided into four categories [31]. The first category is functional daily necessities, such as containers or furniture, which are manufactured according to the traditional manual mode of production. The markets and user groups of these products are mainly in rural areas, as they can easily be replaced by industrially manufactured competing products made of plastic or metal. The second category is handmade high-value-added bamboo art by ICH master inheritors. With high a price and low production, the user group is small, and the market is similar to that of art collections. The third category is traditional bamboo handcrafts that are both functional and artistic, with an affordable price. The fourth category includes bamboo curtains, mats, and other plane-woven products, the manufacturing process of which has been industrialized to some degree, with labor division and machine application.

As an ICH, bamboo basketry mainly refers to artworks (category 2) and functional crafts (category 3). With the support of China's national ICH preserving policies, artworks have stable practitioners and inheritance paths, and there are no concerns with respect to their sustainability. Functional crafts are widely appreciated, but consumers are sensitive to their price, which is affected by their high complexity and the low productivity. Furthermore, product quality relies on the skills of the workers. Therefore, sustainability concerns with respect to bamboo basketry are focused on functional crafts, with two main problems. The first is the shrinking worker group. The craft requires workers to complete a period of training before they are able to make products of standard quality. Workers are required for full-time participation, which is not attractive to young people. Current practitioners are mostly people with a traditional family background, and it is difficult to attract enough workers and qualified outsourcers to improve productivity. The second problem is the minimal added value of the products. As an ICH, bamboo basketry has been subject to few adaptive innovations to meet the needs of modern society, either functional or aesthetic.

These two problems of functional crafts are both deficiencies and opportunities. Solving these problems will incorporate innovation resources from outside of the industry. In return, research on design and design technology can also be promoted to form a cycle that leads to sustainability.

3.2. The Absence of Professional Designers

The disadvantages of bamboo basketry in the modern world are often attributed to the competitive disadvantages compared with industrial products [68], although this is not the key issue. In modern society, product markets and user values tend to be diversified and can accommodate a variety of unique preferences. The main problem lies in the product itself. According to Laufer's book, *Chinese Baskets* [30], published in 1925, bamboo basketry products have hardly changed in the current Chinese market from those made a century ago. The products appear to be in a static state and unaffected by changes in the world.

However, bamboo basketry has been subject to innovation, although mainly in artworks. *Chinese Bamboo Craft* by Zhang Qisheng [31], academician of the Chinese Academy of Engineering, and *Chinese Bamboo Weaving Art* by Xu Huadang [32], a national ICH inheritor of bamboo basketry, provide a detailed overview of bamboo weaving art in China. In the past 50 years, there have been many innovations in large and high-price bamboo artworks, the common innovation style of which can be summed up in one word: *complexity*. The degree of fineness, the number of pattern types, the difficulty of the process and even the size of works have become competitive indicators that are pursued the masters.

However, these innovations are unlikely to create enough sustainable opportunities for the industry due to three reasons. First, the production of such works is very low, and most of them require experienced masters. It is quite usual for a master to produce a single work every few years. Secondly, the circulation scope is quite narrow, and gifts and collectibles are the most probable destination. Thirdly, the difficulty of the craft and the excessive time cost makes it unattractive as a full-time career.

The value of innovation in Chinese bamboo basketry is largely anchored by labor input [69], such as splitting the width of the strip down to less than one millimeter, employing an increasing number of patterns, using complex weaving techniques and making products of larger size. In this type of innovation, professional designers do not have much of a role to play. Therefore, the crux of the problem is the lack of low-cost, highly creative, high-value-added products for the mass user market. The solution is to introduce enough professional designers rather than to train more skilled craftsmen. The latter is usually difficult. Due to the lack of labor division between design and manufacturing in many traditional ICH products, handicraft occupies an absolute dominant position. Design and creativity often mean change, which is not what the craftsmen were trained to pursue. In many ICH industries, there is no such independent stakeholder as a designer, whose role has long been fulfilled by manufacturing technicians. The hand-weaving process is the core of the whole industrial chain, which depresses the position and influence of creative design work.

Without professional designers, it is difficult for modern design ideas to serve this ICH product, although such ideas have been accepted for many years in the product world. Furthermore, there is a corresponding lack of studies on markets, users, demand study a series of industrial units to adapt products to the modern environment.

The underlying reason the lack of professional designers is technical obstacles.

3.3. Technical Requirements for Introducing a New Stakeholder

For ICH products comprising visual patterns, such as batik or embroidery, painters can be invited to draw the pattern, and they do not need to know the manufacturing details. However, the drawing of bamboo baskets is difficult [69] due to the complex and diversified weaving structure details. The exact painting of woven products is not easy, even for professional painters, so the design scheme has to be completed and stored in the mind of the craftsmen.

In the past, craftsmen usually communicated with customers by showing samples, which was enough for customers to make their choice. The problem now is that producers have to actively communicate with potential clients to ascertain their preferences and needs and innovate to satisfy them. The medium for communication may not necessarily be samples, and digital images or models for design are more suitable for this information era.

The development of digital design technology is rich, yet the problems of weaving structure design and expression remain unsolved. The operations required for 2D drawing or 3D modeling are considerable, and the accuracy usually cannot meet the requirements. These difficulties often frustrate designers and extinguish their interest in participating in bamboo basket design unless they are willing to spend time to be trained to become a skilled technician, enabling them to express their creative ideas by their own hands.

We investigated and interviewed designers and craftsmen, deriving the following technical requirements [70]:

(1) Generation of 3D forms of bamboo baskets with precise weaving structure details;
(2) Automatic transformation of design drafts into patterns with over–under structures;
(3) For non-orthogonal free weaving structures, automatic conversion of interweaving free curves in a sketch into 3D over–under structures; and
(4) An accurate estimation of the material preparation.

We also propose two basic principles:

(1) The original handicraft features should be maintained to the greatest extent possible within the scope of users' direct experience; and
(2) In the design process, R&D, management and other units invisible to users, the industry's organization and behavior should be enhanced to a standardized level of modern production.

According to these principles, technology can help the bamboo basketry industry adapt to modern society and prevent the loss of the authenticity of ICHs, which is a concern of many inheritors and scholars.

4. Technical Development

4.1. Sustainability-Oriented Technical Objectives

Many different technical solutions are available to realize software functions, depending on the developer's commercial benefits, the sustainability of the bamboo basketry industry, ICH preservation and even the personal interests. Our goal is to introduce new stakeholders into the industry by creating convenience through technical tools [71]. These new stakeholders fall into three categories:

(1) Professional designers with regular design education;
(2) Designers who shifting from traditional bamboo basketry craftsmen; and
(3) R&D for bamboo basketry design technology.

The three types of stakeholders include both designer and developer roles (designers come from two different sources). These two roles are stable in regular modern industries but not in many ICH industries, especially the role of technology developers [72]. Therefore, the essence of the technical goal is to bridge the missing links.

ICH industries could solve many problems if they professional designers could be deployed, who can make flexible changes in response to the social environment. However, many ICHs are in remote and undeveloped areas in which it is difficult for designers to stay and remain engaged in the design of a single type of product for long time. Design technology enables designers to work anywhere and convey their ideas and designs to producers through well-expressed technical files.

The introduction of designers can be realized through design technology, which provides efficient and accurate technical means to express design ideas. If bamboo craftsmen can easily understand a designer's idea, the independent product design role can be smoothly implemented in the industry.

The shift from the role of craftsman to that of designer can be achieved through positive user interaction through the technology's working style. Craftsmen are generally not skilled in using design software, so the technology needs to be user-friendly. Von Hippel's definition of the user innovation toolbox [53] illustrates the basic principles. In the case of bamboo basketry, well-designed software can enable more people to participate and take on the role of designer.

The introduction of design technology developers is based on the fact that bamboo basketry products comprise structurally complex design elements, each of which require specific design tools. This is a considerable undertaking and requires a sizable investment, requiring a considerable number of developers with non-commercial background to maintain the sustainability of the work.

The above three goals provide guidelines and constraints for our development work.

4.2. Technical Functions Realized

4.2.1. Platform and Development Tool

We chose secondary development to implement the project, i.e., based on an existing CAD platform through a software plug-in.

The programming platform provides a rich library of functions that can perform basic mathematical and graphic calculations, such as finding the tangent of a curve, dividing a curve, finding the normal vector of a surface, calculating the intersection of curves or surfaces, moving along the surface normal vector, etc. The function library considerably simplifies the programming work.

The survey results show that more designers than programmers are interested in developing software for bamboo basket design, as designers are more familiar with the product and understand the value of such technical tools. The motivations of designers and programmers differ; programmers are commercially driven and are less likely to use the software they develop, whereas designers are career-driven and are comfortable with being the sole user of the software they create. The goal of a designer is not to develop a software for commercial sale but to use it themselves to increase the competitiveness of their designs.

Stimulating the R&D potential of the designer group is a basic strategy of user innovation, which can initiate R&D activities at a low cost.

Von Hippel's research on user innovation showed that users involved in innovation and development activities generally do not work with the goal of economic gains [52]. They are more interested in the value their achievement can bring to themselves, such as status and respect from their peers, as well as potential business opportunities. Many secondary development tools of CAD software are designed for users rather than professional developers and are therefore easy to use. The biggest challenge is that users need to learn to use secondary development tools. Our practice proves that such tools possess the characteristics of a user innovation toolbox as defined by von Hippel, enabling users to realize impressive design ideas, most of which are difficult for professional programmers to conceive of.

The following chart shows the technical route of the work described in this paper and the expected social effects in the bamboo basketry industry (Figure 1).

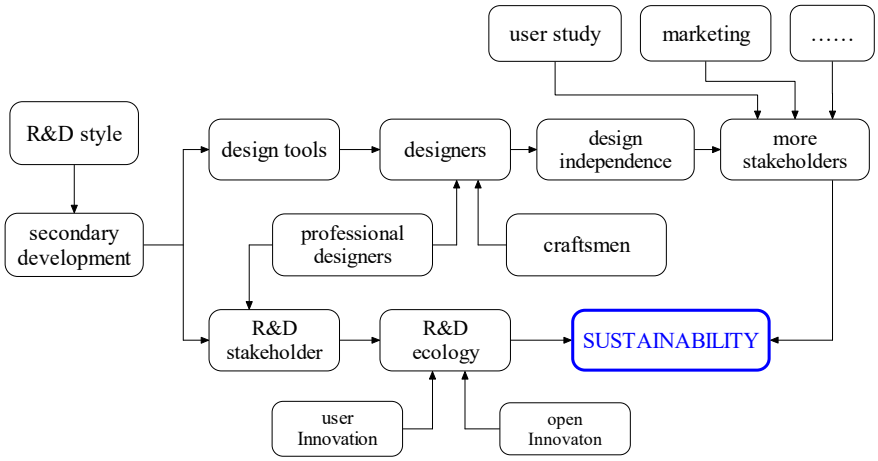


Figure 1. Technical route and expected effects.

We adopted three software platforms, namely Rhinoceros, CorelDraw and Excel. All three are commonly used by designers and include secondary development tools. Their working modes are shown in Figure 2.

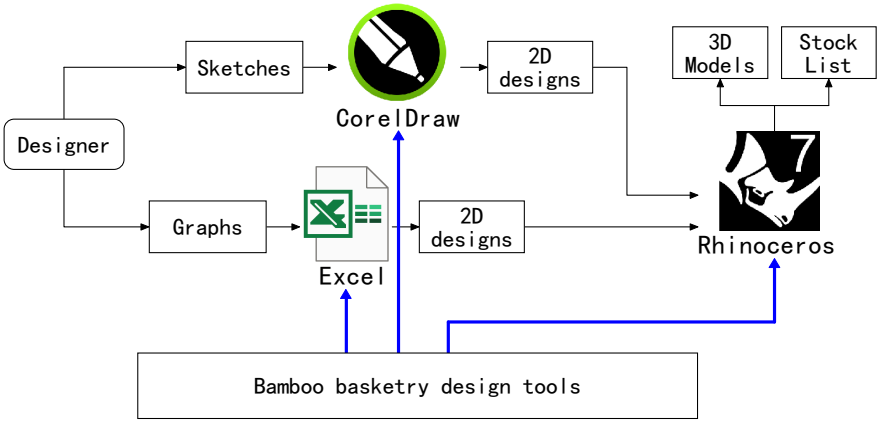


Figure 2. The collaborative working mode of tree software platforms.

CorelDraw helps designer to draw 2D sketches, Excel defines accurate cross-weaving structures and Rhinoceros accepts the output from CorelDraw and Excel and builds 3D models, together with the material list. The sketch a designer draws certain format requirements, which are relatively easy to master.

The following is a brief introduction to realization of the four basic functions, which are demonstrated in the Supplementary Materials *Bamboo and Rattan Product Modeling Tools*.

4.2.2. Basic Cross Weaving

Cross weaving is the most basic and common basketry structure for which visual display is the primary task of bamboo basket design.

In this work, we adopted the modeling method of *basic surface shape and strip mapping deformation*; the surface shape details are established first without weaving structure, and then the bamboo strips are mapped to the surface. In this way, the modeling task is divided into two parts: the designer completes the surface design and defines the strip structure; then, the program builds the 3D structure with the strips, as shown below:

In Figure 3, the surface was manually built in Rhinoceros. The strip structure was defined with a matrix to express the over–under relationship at each cross point. The weaving structure on the right was built via the mapping method according to the surface model and the matrix. If the strip section is not circular (most of sections of bamboo strips are not circular), extra operations are required to correct the spatial directions of the strips (by the program).

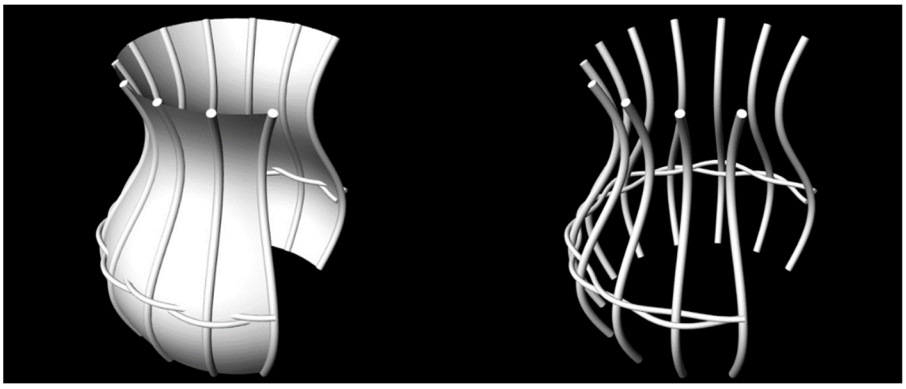


Figure 3. Model of basic orthogonal weaving structure.

This modeling approach considers the designer's creative concept and the computational accuracy and efficiency of the program, whereas the user's task is to build the surface model and define the matrix, both of which are simple tasks.

4.2.3. User-Friendly 2D Drafting Tools

High learning cost is one of the factors that prevent designers from introducing new products. Our interview revealed that among the main reasons designers are willing to learn new skills is the need for frequent use. Unfortunately, the design of bamboo baskets does not fall into this category, nor is it a high-return business.

Therefore, we adopted the concept of *heat transfer printing*, which allows the user to sketch with 2D tools, and the program converts the sketch into a 3D weaving structure.

Two types of 2D design tools were developed, both of which are orthogonal cross-weaving design tools.

The first tool enables design work by processing black and white images. The program interprets black and white pixels as the lifting and pressing of bamboo strips in the longitudinal and latitudinal directions. As shown below, the black and white image is mapped to the product surface (Figure 4).

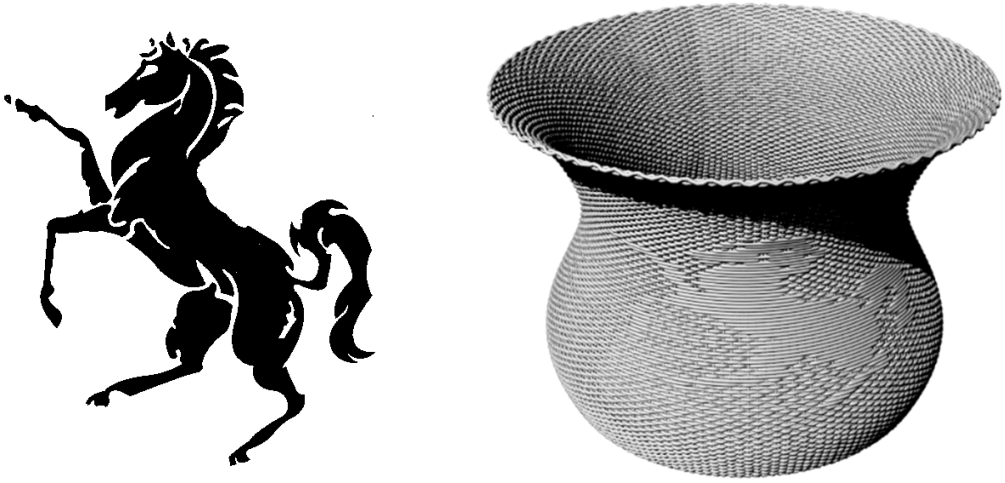


Figure 4. Black and white pattern mapped as a weaving structure.

The other tool uses Excel, which can incorporate more design variables than a bitmap. The program is designed to interpret Excel information as follows:

(1) The color of a cell (black or white) represents the lifting and pressing relationship of the bamboo strips in the two cross directions;
(2) The width of the row or column represents the width of the bamboo strips in two respective directions; and
(3) The color of the cell in the last row or column represents the color of the bamboo strips in the row or column.

Designers can create Excel files manually or using plug-ins (provided by the developer). The software reads an Excel sheet in the 3D software Rhinoceros and models the strips based on the previous built surface and the Excel file, as shown below (Figure 5).

The designer makes an Excel sheet (presented above the 3D model in Figure 5), from which data is read and mapped onto the surface to form a 3D model with full details of weaving structures.

Figure 5. Excel sheets mapped as woven structures.

4.2.4. Free Weaving and Interactive Design

Most existing bamboo basket design tools are applicable to orthogonal cross weaving. However, many creative designs may contain free weaving structures that cannot be expressed in Excel or 2D graphs. Therefore, we designed an interactive modeling method (Figure 6) that functions as follows:

(1) A planar vector sketch is created of the strips in CorelDraw or Rhinoceros without considering the over–under relationships;
(2) A program running in Rhinoceros identifies the cross points of the curves and processes them into alternate over–under structures. After 3D models are built, an identifier is placed at each cross point;
(3) The user interactively selects (or deselects) the identifiers, and the program flips the over–under relationship of the cross points linked to the selected identifiers, generating a new 3D model. This loop continues until the modification is complete.

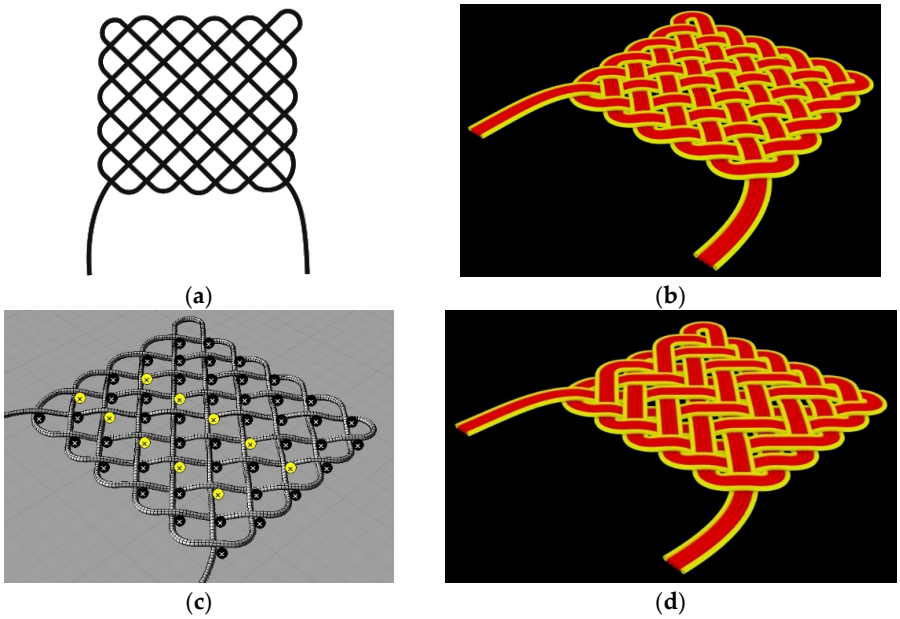


Figure 6. Free-woven structures created through interactive operation. (**a**) Original 2D sketch; (**b**) automatically built 3D model; (**c**) identifiers at the cross points (yellow points are selected to be flipped; (**d**) regenerated model according to the identifier selections.

This interactive method creates a design process of continuous engagement for the user, who can improve their design step by step with real-time visualization instead of specifying all the details at the beginning of the process. It is a challenge to instruct the program to modify a specific part in a complex weaving structure model. The proposed technique solves this problem by presenting identifiers as visible avatars for every cross point.

4.2.5. Connecting, Wrapping, Plaiting and Knotting

In addition to orthogonal cross weaving and free weaving, there are many auxiliary structures for edges and accessories. We developed design tools for four frequently used auxiliary structures: connecting, wrapping, plaiting and knotting.

Connecting structures are used to join multiple weaving structures together as a whole because breaking a complex product into separated parts can simplify design and modeling work. Building a digital model involves logic distinct from that required to build a real product. The connecting tool automatically joins independently built curve groups at their nearest ends to form a complete curve path for subsequent sweeping modeling of bamboo strips (Figure 7).

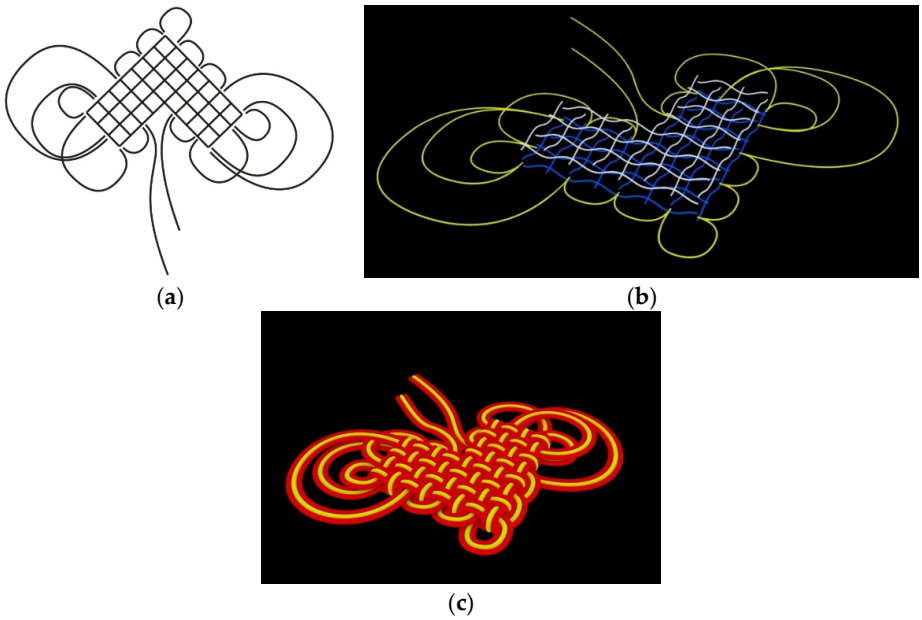


Figure 7. Connecting of parts. (**a**) Original 2D sketch; (**b**) generated 3D curves (the center part has double layers to be connected); (**c**) complete model.

Wrapping structures wrap and bind solid bodies, such as the edges of a container. Physical and mechanical factors are considered ensure that the winding structures are in a tensioned state (Figure 8).

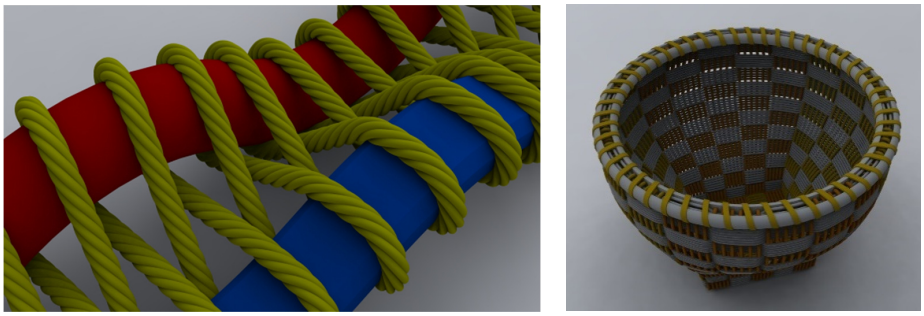


Figure 8. Two wrapping structures.

Plaiting structures help to model plaited flexible ropes. In addition to the alternately wound plaited structure, the model must be mechanically realistic and reasonable, just like the wrapping structures. The tensed ropes shown in Figure 9 represent a combined application of wrapping and plaiting tools.

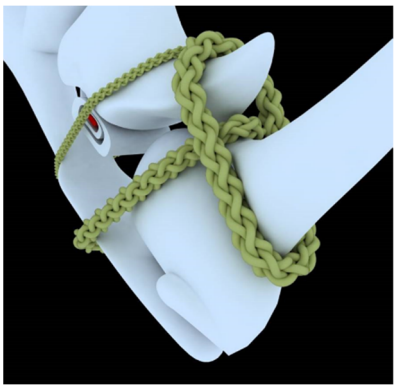
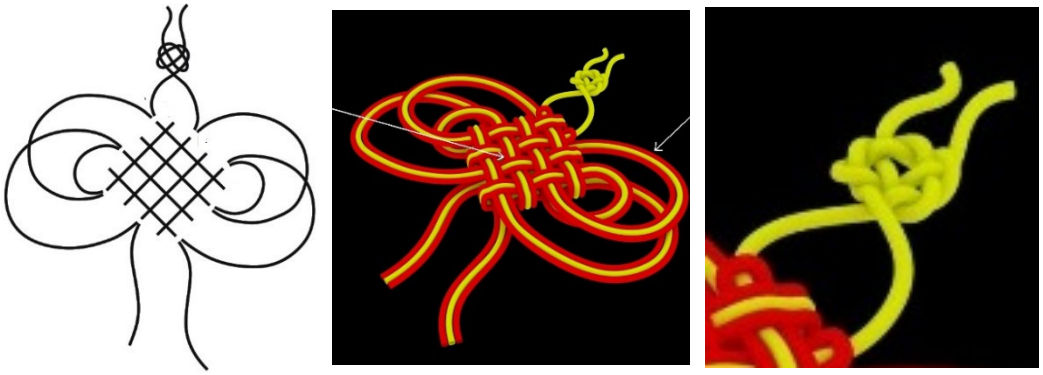


Figure 9. Plaiting structure.

Knotting structures build 3D knot models. Knots made of materials such as bamboo and rattan are generally not complicated in order to prevent breaking. The program employs a simple modeling method of planar knots, whereby knots are expressed as tightly tensed over–under structures in a free weaving style (Figure 10).



(**a**) (**b**) (**c**)

Figure 10. Knotting structure. (**a**) 2D draft; (**b**) generated 3D model from the draft; (**c**) detail of the knot.

5. Practice and Influence on the Sustainability of the Bamboo Basketry Industry

The proposed design tools were provided to bamboo basketry artists and designers for trial and improvement and to determine further needs. As practitioners of user innovation theory in design technology, we also need proof to encourage us to continue.

5.1. Practice in Pet Nest Design

The proposed software was first applied to the design of woven pet beds made of bamboo or willow. The company we worked with has been engaged in the OEM business for a long time and intends to develop original designs for their foreign customers to improve profits. However, it is difficult to provide their clients with realistic images of new designs that can be communicated through the internet without building samples.

The software partly solved their problem. The 3D modeling of various cross-weaving products provides a good medium for discussion for communication between designers and customers, as shown in Figure 11.

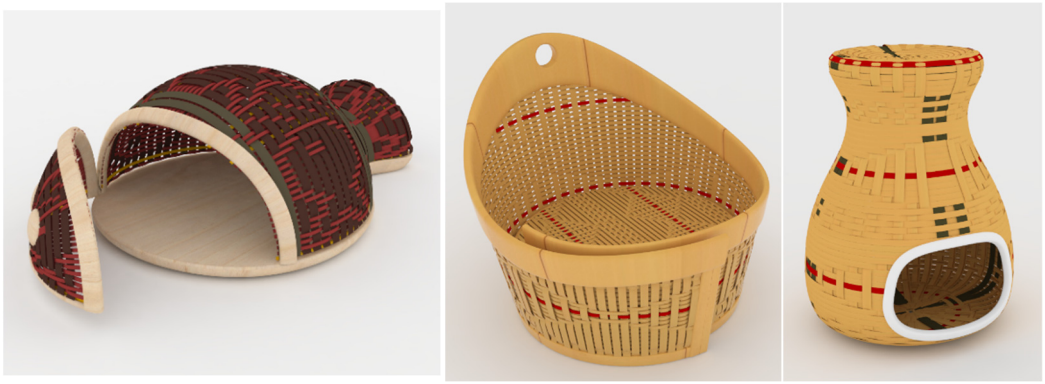
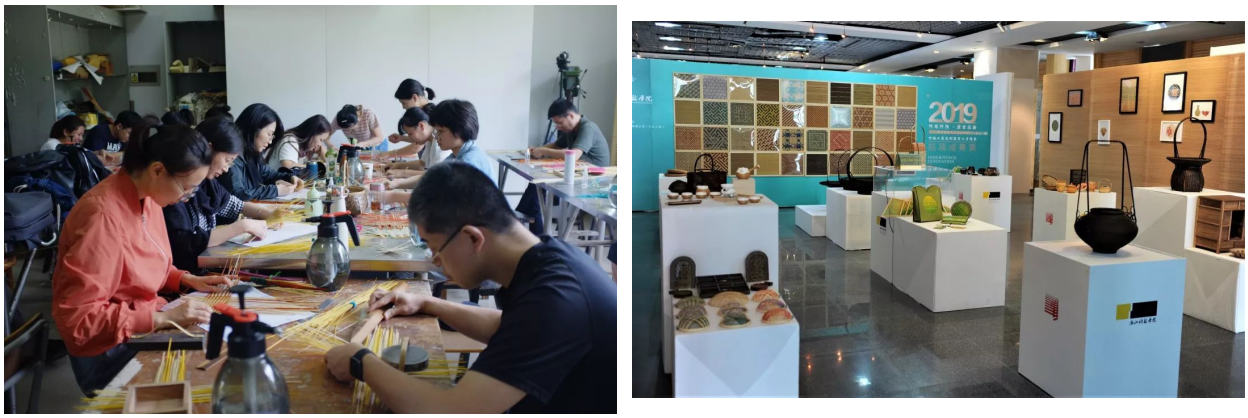


Figure 11. Pet nest designs for communication with customers.

By applying the proposed technology, the company considerably increased the designs available to their customers.

5.2. Training of Professional Designers

The *National Arts Fund of China* is a national program intended to support the cultivation of artistic creation and innovative talents. In 2019, it funded a project to train bamboo basketry designers, recruiting approximately 40 members with design or manufacturing experience to participate in a two-month training. The members included bamboo basketry craftsmen, professional designers and university teachers in a design program. Our team invited to teach the principles of CAD technology for bamboo basket design (Figure 12).



(**a**) (**b**)

Figure 12. Bamboo woven ICH product design and making course and the resulting works. (**a**) Trainees at work; (**b**) the work of trainees on exhibit.

Many of the members were introduced to design technologies for the first time and showed considerable interest. The three types of members presented with different requirements based on their professional backgrounds.

Craftsmen are eager to preview and evaluate their ideas or designs with the help of software. In the past, most craftsmen worked with only rough sketches or literal descriptions of desired changes relative existing products. In order to evaluate innovative new designs, they usually make samples. The proposed technology is just what they need.

Professional designers aim to test ideas and explore possibilities by creating unique personal designs, benefitting from the functions of software. The efficiency of the proposed software makes it possible to create bamboo basket designs as a part-time job.

Some university teachers realized the R&D potential of the technology. They hope to participate in development work and develop academic projects to apply for official funding.

Three independent tends to emerged from this training session: division of the manufacturing unit, external design resources, university-level R&D.

5.3. Technology Extension in Other ICH Products

The charm of bamboo basketry mainly lies in the unique complexity and sense of rhythm of weaving structures, which make it a visual symbol and is widely used in many other ICH visual art forms. For example, we identified demands for weaving patterns for paper-cutting art and folding fan products.

Paper-cutting art and folding fans are both national ICHs in China. Their design is basically graphic design, and the main demand is to draw a visual form of a weaving structure similar the interwoven structure in Celtic patterns [67].

One of the demands for weaving patterns proposed for paper-cutting art is to express gray tones; traditional paper-cutting involves silhouette, and grayscale is usually expressed by borrowing strokes from woodcutting practice, employing strip with varying widths. Because certain mechanical properties must be guaranteed for paper objects, the strips cannot be too long or too thin in order to avoid deformation and fracture.

The tools for basket design were revised according to the demand to build strips with varying widths and visually interweaving structures for artistic effect, as shown in Figure 13, in which two Chinese characters (with the meaning of *bamboo wind*) are hidden.

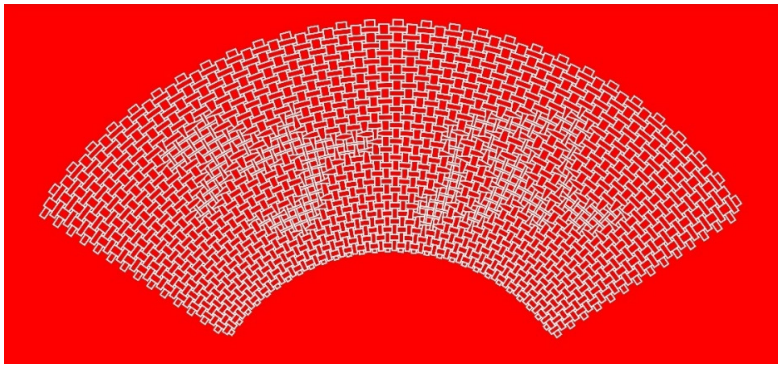
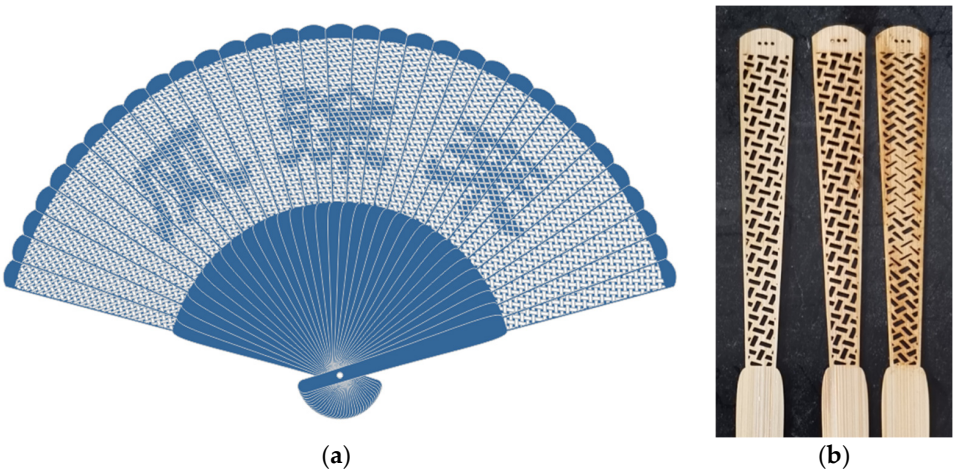


Figure 13. Interweaving pattern in paper-cutting art.

Weaving patterns are applied to folding fans to decorate hollowed-out bamboo fans with bones made of carved bamboo strips. The fan requires a large area of hollow background with sufficient strength. Weaving patterns can meet both requirements, as shown in Figure 14. The basic technical principle is similar to that of paper cutting.



(**a**) (**b**)

Figure 14. Interweaving pattern of a bamboo fan (The three Chinese characters hidden in it is the Brand of the product). (**a**) The design; (**b**) sample of bones.

Weaving structures or their visual patterns are widely used in traditional products. Therefore, the technology proposed in this paper can meet the demands of various ICHs.

However, clear technical requirements are rarely available for most ICHs; therefore, technological interventions need to be proposed by people who are familiar with both design and programming.

5.4. Sustainability of Technical Development and Ecology Building

Although the proposed technology is interesting and exciting, our team has received only approximately USD 20,000 in funding since our research began from 2004 because the market is too small to secure substantial investment to support long-term commercial development. User innovation is an important factor to guarantee the sustainability of the ICH industry. With enough participants, the development of technical tools is likely to become a normalized demand, with numerous existing and novel weaving patterns waiting to be modeled and for further innovation.

The development concept presented in Section 4.2.1 is not conventional for commercial software. However, considering the low frequency of use and small number of users, the sustainability of the design technology itself is equally important as that of the products. The combination of user innovation and open-source development may be an appropriate option. Most CAD software provides a secondary development platform and function libraries, and Rhinoceros even provides a user-oriented programming-free development platform known as Grasshopper. These user innovation toolboxes are helpful in developing the R&D ecosystem.

We have attempted to encourage industrial design graduate students to participate in development and have achieved some satisfying results. With a background in design and art rather than software engineering, these graduates mastered programming skills after short training periods and developed their own plug-ins, which considerably stimulated their research interests. Some students even set up their own bamboo basketry design studios after graduation because they realized the personal advantages in this niche product area with the help of their new-found development skills.

It is often difficult to obtain investment for initial technical research that usually begins in the university setting due to the unclear commercial interests; however, it is possible to obtain start-up funds from the government with proof of early achievements. This is the best starting point for ecological environmental construction.

6. Discussion

The contribution we aim to make to the sustainability of the ICH industry is to introduce two types of key stakeholders that are often lacking or absent in many ICH industries. The first is the leading user defined by von Hippel [57], i.e., the designer who can develop design tools for self-use. The second is the designer who is interested in bamboo baskets design with the help of design tools. We hope that a portion of the second group can be converted into members of the first group. Thus, a continuous human resource supply loop will be established, which is a basic prerequisite for sustainability.

Because the proposed technology is still primitive, its impact on the ICH industry of bamboo basketry can only be predicted based on our limited practical experience. So far, through the digital models generated by proposed tools, the communication between designers and manufacturers has proven smooth and efficient, and designers from design agencies can design successful products without having to weave them themselves.

In this paper, we presented an example of user innovation in ICH product design. Von Hippel provided many examples of successful implementation of user innovation theory, also implying the premise that the users should be *leading users*, i.e., users with the ability to develop a product they want to use, with the user innovation toolbox as a premise.

In this case, the user refers to the user of the design technology, namely the designer, whereas the product refers to the design technology or software. User innovation occurs when designers begin to develop their own design tools. After having been trained in basic

programming skills, designers already meet Von Hippel's definition of leading users, and the user-oriented secondary development tools provided by CAD platforms also basically conform with the concept of user innovation toolbox. We have also run a course to teach designers how to develop their own personalized tools, proving the feasibility of this concept.

However, with approximately 12 years of experience running this course, we have found that the user innovation style has some limitations, as follow:

(1) Robustness of the software: Designers can write code but lack experience in software development, so the user interaction of the software they write is usually poor. Therefore, software developed by designers serves best as a prototype with low commercial value. However, the designer's innovative concept is at least realized.
(2) The problem of universality: Bamboo basket design is associated with a variety of structures, so design software needs to provide a certain degree of versatility. This requires an ability to abstract with respect to the technology's functions. A common problem is that when a designer comes across a new structure, instead of modifying the code to make it more versatile, they usually write a new program.
(3) Application of user innovation outputs: People who are interested in writing design tools for their own use are generally less inclined to share or sell their program, lest they lose their advantage. This results in repeated programming of similar functions. Therefore, the techniques published in the literature on bamboo basket design are similar, almost all of which involve basic cross-weaving. A developer community is necessary, just like the open-source software community.

As for the third limitation, universities can play the role of organizers in the ecological environment building of developers, which can also help to solve the first two limitations. We are encouraged by professional programmers and software companies beginning to show an interest after experiencing the proposed tools. These software prototypes and their outputs made them feel that it is completely feasible to redevelop such tools on a new platform and in a more efficient programming language. Demonstrations of these prototypes can also help to convince investors to provide their support. As evidence, an entrepreneur project based on our early achievements has successfully obtained government funding.

7. Conclusions

The sustainability of bamboo basketry not only has the general characteristics of ICH products but also has involves personalized features. Through the work presented in this paper, we aim to target the bottleneck of design technology to improve the ICH industry to help it adapt to modern society.

We believe that the work presented in this paper will contribute to the sustainability of ICH industries as follows:

(1) The sustainability of ICH products depends on the sustainability of the ICH industry. Modern society is a diversified world, including a variety of preference groups, and the Internet allows many niche products to quickly find their markets. Adaptive industries have some common features, including stakeholder structure.
(2) The sustainability of the ICH industry depends on a complete range of stakeholder types. The bamboo basketry industry lacks a designer group, which is a key role, as well as closely related stakeholders in market research, user research, and technical development, which are key to the sustainability of industry; such stakeholders will only participate on the condition that designers are already engaged in the industry.
(3) The proposed design technology for bamboo basketry offers promise to encourage the participation key stakeholders, i.e., designers, either through external recruitment or by developing talent within the industry. Design technology can serve to catalyze modernization of the industry.
(4) The technical system itself also needs to be sustainable. A good ecological environment is necessary and will generate spillover effects and benefit other types of ICH products.

User innovation has been proven to be a suitable method, even if the output is only prototypes.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/su141912058/s1, Video S1: Bamboo and Rattan Product Modeling Tools.

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How the Experience Designs of Sustainable Festive Events Affect Cultural Emotion, Travel Motivation, and Behavioral Intention

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Abstract: Festivals are an important aspect of cultural design. They not only attract a large number of tourists but are also one of the most direct ways of promoting local culture. This study aimed to discover how festival experiences affect cultural feelings, travel motivations, and behavioral intentions. Based on literature research, theoretical model construction, and analysis, this paper begins with an exploration of the literature and designs a structural model to validate consumers' expectations and conceptions of the 2021 Tainan Chihsi Festival. A total of 238 residents from Taiwan answered the questionnaire. This study used SEM and ANOVA for data analysis. The impact model of the festival experience design presented here can provide reference standards for in-depth research in related fields. Moreover, cultural emotion is a critical component in designing influential festive event experiences that evoke travel motivations and behavioral intentions. Virtual events can emphasize personal elements and educational content. In-person events can emphasize group interaction and entertainment. A combination of virtual and in-person experiences or personal and group exchanges would be ideal. Organizers should consider including emotional elements in their festive events in addition to originality. The inclusion of cultural elements can also foster "shared" experiences between locals and visitors, diversifying urban landscapes and strengthening community interaction. Organizers can plan festive events that align with consumers' expectations, distinguish festive events from other community events, and add uniqueness and originality to their events.

Keywords: festive events; experience design; cultural emotion; travel motivation; behavioral intention

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1. Introduction

Festivals tend to be culturally or geographically unique. The themes and images of festivals are shaped by the events held during the festive period. Festive events are fun and evoke sharing. They promote local traditions and cultures through celebration and are ideal venues for marketing local products and services, conveying ideologies and information, and showcasing communities. In addition to attracting tourists, festive events are also direct avenues for promoting local culture [1,2]. Mair and Whitford [3] mention that festive events are a disrupter of conventional tourism and a driver of culture, art, and urban regeneration. They are turning into a unique lifestyle industry that is quickly gaining international attention. The cultural content of festive events culminates in in-depth experiences, creative products, and spatial aesthetics, bringing tourism and economic benefits to local regions. Moreover, highlighting festive events in tourism has become a key strategy in many countries for the development of an experience economy, creating environments to learn about local history and satisfy nostalgia. Intrinsically, festivals contribute to social cohesion and raise the innovation and confidence of local industries. Extrinsically, they form positive city imagery and balance cultural production and cultural consumption. Together, festivals promote the sustainable development of local culture, preserve social harmony, and encourage interaction [4,5]. Culture is an accumulated asset. Festive events are a means for accumulating long-lasting culture and driving long-term integration and consensus. Therefore, protecting and ensuring the sustainable development

of cultural assets and tourism landmarks are just as important as any other economic system [6–8]. With so many different festive events in the world, can they truly be said to contain cultural content? Will these events persevere or will their dominance be eroded over time? Instead of highly marketed goods and services, the cultural value of consumer items must be preserved, for only by preserving events with cultural value will they remain relevant over time. Ashworth and Voogd [9] assert that festive events are powerful tools of communication and an indispensable component of urban marketing strategies. They effectively shape local imagery and experiences. Furthermore, intangible heritage should be passed on and preserved from generation to generation as it fosters cultural identity and continuity. However, at this stage, most of these festivals are often too focused on short-term benefits and mostly tend to be conservative. Therefore, local cultures must be integrated with liberal arts to nurture cultural value and create sustainable tourism benefits.

The COVID-19 pandemic has ravaged the world since 2019. As situations gradually improve in certain countries, travel intentions are beginning to surge. Affordability is no longer the primary concern, and tourists are swarming to natural and manmade attractions. The pandemic will eventually pass. Therefore, the time has come for vendors to seriously consider venues and events that will satisfy visitors' cultural expectations rather than produce short-term gain. Topics worth exploring include, but are not limited to, what sort of atmosphere attracts visitors, what factors affect voluntary engagement, and what aspects visitors are willing to spend their money and time on. Regardless of how the world changes, people will always seek leisure, entertainment, and unique experiences. In this study, we examined the experience designs of events organized for the Tainan Chihsi Festival and determined whether these designs affected visitors' cultural emotion and participatory willingness. We developed the Festival Experience Design Influence Model to examine several cases. The results of this study can serve as a reference for the future application and development of education and design.

2. Literature Review

2.1. Experience Designs of Festive Events

Csikszentmihalyi [10] introduced the concept of flow experience, defining it as a state in which people are so involved in an event they enter a state of autopilot or "flow". Flow is a way to feel a sense of joy in an activity and that nothing else seems to matter, as shown in Figure 1. Therefore, flow experiences are considered the ultimate form of enjoyment. Flow is associated with the formation of meaning, which gradually manifests into a flow experience. Consumer experiences derive from the pursuit of fantasy, feelings, and fun. For tourists, it is the products and services they encounter during their travels that shape their emotional connection to their destination. Festive events can be intricately designed to enhance authenticity and solicit positive emotions, such as a latent concept like "flow", a feeling that creeps up from the bottom. When visitors perceive a festive event to be authentic, they are more likely to feel connected to the festival. Therefore, a successful event must be able to arouse the emotions and perceptions of its participants [11–14].

Schmitt [15] proposed five strategic experiential modules: sensory experiences (SENSE); affective experiences (FEEL); creative cognitive experiences (THINK); physical experiences, behaviors, and lifestyles (ACT); and social-identity experiences that result from relating to a reference group or culture (RELATE). These modules aimed to explain how people's experiences impact their emotions. Pine and Gilmore [16] asserted that experiences are emotionally charged and evoke consumers who attach immense value to products and services. The researchers also mention that attractive and engaging experience activities let an individual reach a certain emotional, intellectual, or even spiritual level, and positive feelings begin to subconsciously emerge. These activities can be classed in four categories: entertainment, education, aesthetics, and differentiation. Education entails that the content is informative and educational. Aesthetics entails that the visual design is pleasing and attractive. Differentiation entails that the activity is unique and helps visitors escape routine.

Lin [17] proposed that "service space" and "qualia" are the key factors in the experienced economy and asserted that events must be designed to enhance the "deeply experience" and "highly aesthetic feeling" of experience design to keep participants engaged. As favorable event designs directly and positively influence participant experiences, visually pleasing events that tell a story or provide cultural context can be mentally stimulating and provide an unforgettable experience to visitors, as shown in Figure 2. Therefore, experience designs are vital when considering ways to incorporate connotative features and cultural attributes into events and curate unforgettable experiences. It can also be inferred that experience designs can promote cultural content and solicit emotional responses. Therefore, they positively influence people's travel motivation.

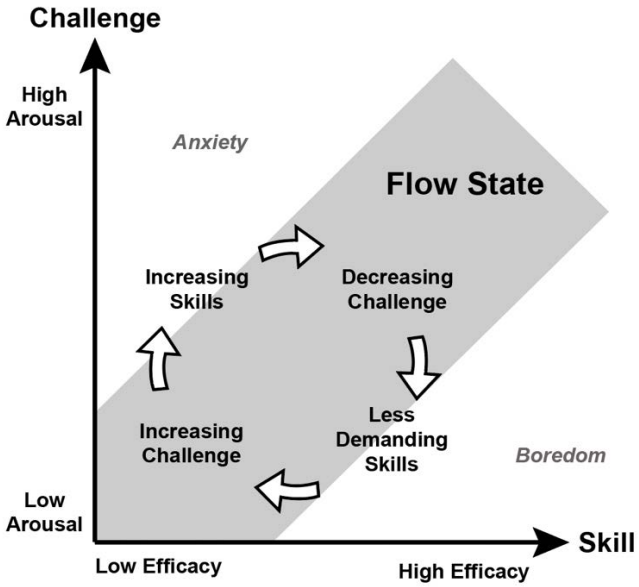

Figure 1. Anxiety, boredom and flow [10].

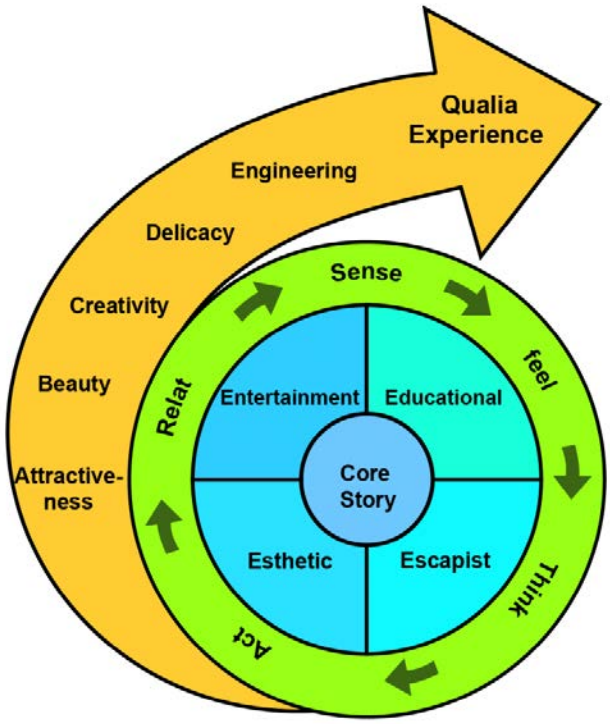

Figure 2. Qualia experience mode (redrawn from [17]).

2.2. Cultural Emotion towards Festivals

Culture is essentially the manifestation of social and historical phenomena. Culture evolves concurrently with humankind. Therefore, it is the accumulation of human development and features qualities of generationality, nationality, and regionality. Culture has memory; not in the physiological sense, but rather as a product of social collectivism. Cultural memory cannot be observed in individuals. Instead, it is communal memory. Similar to individuals, communities (which include ethnicity and nationality) develop the ability to store and retrieve memories as they evolve [18]. Assmann [19] maintained that cultural memory is preserved, replicated, and disseminated through language, faith, literature, and education. Erll [20] distinguished between social, material and mental dimensions of cultural memory and defined "cultural memory" broadly as the interplay of present and past in socio-cultural contexts. Tao [21] also proposed that cultural memory can be divided into three dimensions: intellectual, emotional, and social (which includes politics, economics, religion, and law). Of these dimensions, the mental and emotional dimensions are the important actuators of cultural memory. They are also directly related to personal feelings.

Emotions are a necessary part of life. They regulate feelings, behaviors, and views. People develop pleasant emotions when they see beautiful things [22]. Evoking pleasant emotions has become a key focus in product and service development in recent years. When people identify with the design features of a product or service, they are more willing to purchase the product or service. Well-designed products and services may even elevate consumers' tastes and personalities. Emotions are also a form of cultural expression. Culture is the foundation or blueprint of emotions, and combining culture and emotions can produce immense enjoyment [23]. Therefore, the emotional dimension is an important reference or actuator of cultural memory. It is also a measure for forecasting tourists' future behaviors [19]. Cultural emotion refers to the positive feelings that tourists have towards local cultures. When tourists acknowledge a culture, they generate affinity towards the culture and the people of that culture. Therefore, tourists' emotions play a significant role in destination selection, purchase behavior, and revisitation willingness [24–26].

Emotional variables are the make-or-break factors of festive events. They are also an important basis for forecasting tourists' future behaviors. Therefore, many past studies on festive events adopted event engagement and place attachment as the emotional variables for analyzing the relationship between emotions and future behaviors [27,28]. Event engagement refers to the degree of involvement in specific events, observed from people's emotional investment, participatory motivation, curiosity, and excitement associated with a specific event [29]. The most common factors for measuring event engagement are attractiveness, centrality, and self-expression [30–32]. Place attachment stems from a sense of place and place identity. It is seen as the emotional connections that people have to specific places prompting them to share their knowledge of the place with others. These emotions drive people to act on their views [33–35]. Therefore, place attachment can be defined as special emotional attachments that people develop after interacting with a specific place. Place attachment can further be subcategorized into place dependence and place identity. Overall, event engagement features attractiveness, centrality, and self-expression, while place attachment features place dependence and place identity. Based on the preceding discussion, it can be inferred that cultural emotion positively influences people's travel motivation and behaviors.

2.3. Travel Motivation and Behavioral Intention

Behaviors, actions, and decisions are intrinsically influenced by motivation. A key factor driving tourism and travel behaviors is travel motivation [36]. Travel motivation is characterized by social and psychological needs that encourage participation in tourism-based activities. According to the theory of push and pull factors, social and psychological needs are driven by the desire to detach from the daily routine (escape) and the desire for psychological compensation in unfamiliar environments (pursuit). Under these forces,

people are motivated to travel. They are the intrinsic drivers of event engagement. They urge people to travel and pursue their goals. In addition, travel and leisure motivation are dynamic, where event engagement increases concurrently with satisfaction [37,38].

Travel motivation also prompts people to voluntarily participate in activities and have fun at a financial loss. Positive feedback fuels intrinsic motivation and engagement increases concurrently with intrinsic motivation and autonomy [39]. Motivation is the main reason for travel and tourism engagement, and positive motivation can induce, regulate, and maintain behaviors. Therefore, travel motivation is a pre-existing variable of behavioral intent.

Maslow's [40] hierarchy of needs is the most cited motivation theory in academia. The theory states that humans are motivated to fulfill their needs in a hierarchical order: physiological needs, safety, love and belonging, esteem, and self-actualization. Travel motivation models based on the hierarchy of needs have been developed by Nickerson and Ellis [41], Goeldner and Ritchie [42] and Pearce [43]. All of the researchers maintained that higher-tiered motivations contained motivations in tiers lower than them and that lower-tiered motivations must be satisfied before pursuing higher-tiered motivations.

The primary composition of attitude comprises perception, emotion, and intention. Intention refers to behavioral intention. It includes the tendency to act a certain way after careful consideration, a psychological expression when no action has taken place, and the intention before making a decision. Behavioral intention reflects people's future behaviors. Therefore, it is an antecedent of action [44–46].

Behavioral intent data are highly representative of actual behaviors and, thus, are considered a reliable measure of behavior. Behavioral intentions are categorized into positive and negative intentions. Positive intentions may be exhibited as listening to word-of-mouth, offering recommendations, showing brand loyalty, increasing frequency of product and service purchases, or buying at higher prices. Negative intentions, on the other hand, may take the form of distancing or reduced spending [47,48]. Thus, travel motivation is likely to have a positive impact on behavioral intentions.

Based on the preceding literature review, it can be seen that cultural emotion mediates experience design and travel motivation. It also mediates experience design and behavioral intention.

3. Methodology

3.1. Research Framework and Hypotheses

This study is a confirmatory analysis of the effects that the experience designs of festive events have on cultural emotion, travel motivation, and behavioral intention. The research framework combines anxiety, boredom, and flow [10] with the qualia experience model [17]. Csikszentmihalyi [10] asserted that flow is a state of peak enjoyment experienced by people engaged in adult play. This definition is the coveted experience examined in this study. Therefore, we included flow state in our concept diagrams. In Figure 1, flow is depicted as a latent state that permeates from the bottom up. It also shows a hierarchy of the various factors, where the x-axis represents feeling, and the y-axis represents corresponding behavior. Overlaying Figures 1 and 3 shows that the x-axis (travel motivation) in Figure 3 overlaps with that (feeling) in Figure 1, and the y-axis (behavior) in Figure 3 overlaps with that (skill) in Figure 1.

The experience design extends from the center of the circle and around the experience design with five elements of cultural emotion. The diagonal line entering the "flow state" can be replaced with the hierarchy of needs theory proposed by Maslow [40]. The x-axis and the y-axis are, respectively, behavioral intention and feelings. Based on the research objectives and the research framework illustrated in Figure 3, the left side of Figure 3 shows the influence diffusion diagram of each dimension, and the right side of Figure 3 shows the integrated detailed diagram.

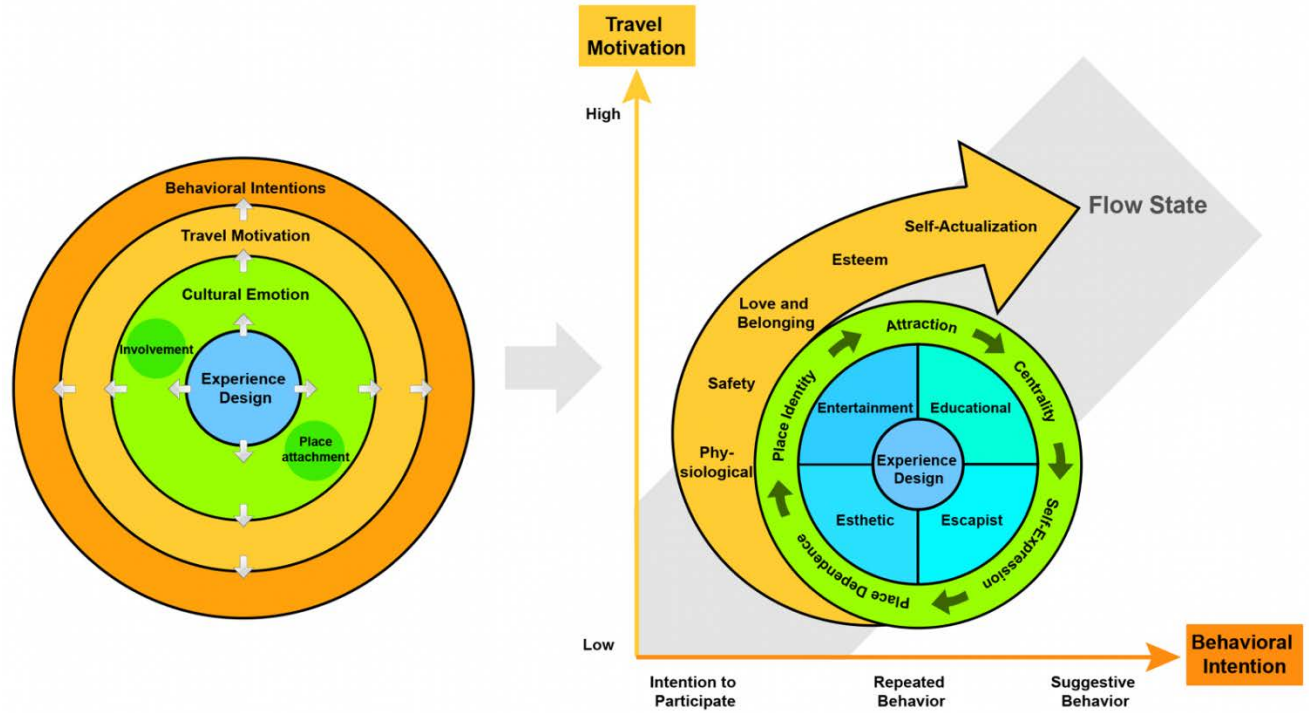

Figure 3. Research framework (source: this study).

The research hypotheses in this study are inferences drawn from a literature review. The author formulated the following hypotheses, along with the Festival Experience Design Influence Model, as shown in Figure 4.

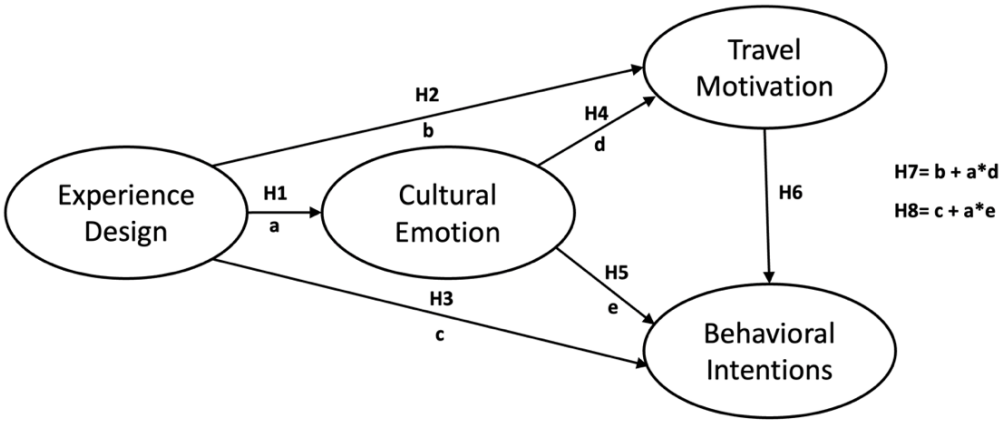

Figure 4. The Festival Experience Design Influence Model (source: this study).

H1. *Experience design significantly and positively influences cultural emotion.*

H2. *Experience design significantly and positively influences travel motivation.*

H3. *Experience design significantly and positively influences behavioral intention.*

H4. *Cultural emotion significantly and positively influences travel motivation.*

H5. *Cultural emotion significantly and positively influences behavioral intention.*

H6. *Travel motivation significantly and positively influences behavioral intention.*

H7. *Cultural emotion mediates experience design and travel motivation.*

H8. *Cultural emotion mediates experience design and behavioral intention.*

3.2. Case Study

Tainan is an old city with a long history and profound cultural heritage. The city is home to the largest number of Yue Lao Temples and national monuments and relics. It is also the confluence for single people seeking a romantic blessing. The city government has even designed a recommended sightseeing map for pilgrims of romance! After the upgrade of special municipalities in Taiwan in 2010, the city government launched the Tainan Chihsi Festival by consolidating the Sweet Sixteen cultural event held every summer since 2000 and popular local Yue Lao Temples under the banner of the City of Love. The festival has been organized every year since, becoming one of Taiwan's largest tourist festivals [49]. The festival, with its cultural connotations, was selected as the research event for this study.

Specifically, we examined the 2021 Tainan Chihsi Festival. The main themes of the festival were Lovers of Showa and Old School Date. Through online interaction and in-person participation, visitors had the opportunity to learn about the pop culture, architectural features, celebrities, and restaurants of the Showa Era and how these elements shaped the landscape of Tainan today. The Tainan Chihsi Festival comprised 11 events, including three virtual events, three in-person events, and numerous collaborative events with local vendors (two virtual and three in-person events). The festival period was between 7 and 22 August 2021. The itinerary of the festival is tabulated in Table 1.

Table 1. The 2021 Tainan Chihsi Festival itinerary.

No.	Name	Type	Introduction
1	Cloud Lovers	Virtual	A virtual chatbot created for the Tainan Chihsi Festival. Join the official Line Account and chat with someone in the Showa Era!
2	Online Tribute to Yue Lao	Virtual	Access the event page through the Official Line account and pay tribute to seven major Yue Lao Temples remotely. Send your wishes directly from your phone. A temple representative performs the matchmaking ceremony for you and provides you with your fortune.
3	Searching for Lovers of Showa	Virtual	Access the event page through the Official Line account. There are six chapters: Encounter, Longing, Acquaintance, Admiration, Adoration, and Love. Each chapter contains several multiple-choice questions. Once complete, the system will match you with someone from the Showa Era based on your responses.
4	Old School Date Day	In-person	This event will be held over a weekend. It features a retro market, games, outdoor cinema, musical performances, and bumper cars, taking you back to the markets of the 1970s, 1980s, and 1990s.
5	Installation Art	In-person	A number of exclusive installation artworks will be displayed at the Blueprint Cultural and Creative Park. The two main attractions, Love Wall and Say I Love You, will bombard your romantic senses with video, audio, and text.
6	Old School Date Special Exhibition	In-person	The exhibition displays popular dating venues in the 1970s, 1980s, and 1990s, including clothing stores, salons, transport stations, and restaurants. Come and enjoy a retro experience.
7	Collecting Love Notes	In-person	Visit designated stores and purchase specific items or spend a specific amount to receive a Love Note (10 in total). Collect any two to redeem a limited edition "Modern Love x Vaccine" Souvenir.
8	Discount Coupons	Hybrid	Enter the merchant number into the official Line Account to receive electronic coupons for all participating stores.
9	Matchmaking Raffle	Hybrid	A joint event between Line Point and local Tainan vendors. Users can access the raffle page between 09:00 and 00:00 via the official Line Account.
10	EAT, DATE, LOVE	In-person	Spend NT 3320 or more at designated restaurants for the chance to partake in the hotel commemorative photo event.
11	HSR Hotel Discounts	In-person	Purchase selected hotel packages during the event to receive hotel and HSR discounts.

Source: [50] Note: Hybrid = virtual and real integration

3.3. Research Tool

This study integrated related research and conducted a data analysis to develop research tools. The analysis focused on experience design, cultural emotion, travel motivation, and behavioral intention. Experience design was represented by four observed variables: entertainment, educational, aesthetic, and escapist. Cultural emotion (i.e., involvement and place attachment) was denoted by five observed variables: attraction, centrality, self-expression, place dependence, and place identity. Travel motivation comprised five observed variables: physiological needs, safety needs, love and belonging needs, esteem needs, and self-actualization needs. Behavioral intention was based on three observed variables: participation intent, repeated behavior, and suggestive behavior. Thus, the questionnaire was composed of four dimensions, 17 variables, and 51 item components, all of which were rated on a seven-point Likert scale, with agreement including options such as: completely agree, mostly agree, slightly agree, neutral, slightly disagree, mostly disagree, completely disagree. The questionnaire was subject to reliability and validity tests, a correlation coefficient analysis, and regression analysis with statistical tests using SPSS 22.0, as well as structural equation modeling (SEM) in AMOS 23.0. All items reflected the latent variables of each dimension. The items were defined and constructed in line with the theoretical analysis of the literature.

The questionnaires were administered over the Internet. The questionnaires targeted people residing in Taiwan who were familiar with the event venue and content. The survey aimed to collect the respondents' perceptions and past experiences. The questionnaire is presented in Table 2.

Table 2. The questionnaire.

Dimension		Code	Item
Experience Design	Entertainment	Ent1	The content of this festival event feels fascinating.
		Ent2	The content of this festival event is interesting.
		Ent3	The content of this festival event is fun.
	Educational	Edu1	This festival evokes a sense of learning.
		Edu2	This festival gives me culture-specific knowledge.
		Edu3	This festival event piqued my curiosity to learn about this culturally relevant thing.
	Esthetic	Est1	The content of this festival event is well designed.
		Est2	The visual aesthetic of this festive event design is great.
		Est3	The concept and value of this festival event attract me very much.
	Escapist	Esc1	This festival event feels like you can play a different role.
		Esc2	This festival event takes people out of the ordinary life situation.
		Esc3	This festival event feels as if you are in another time and place.
Cultural Emotion (Involvement, Place Attachment)	Attraction	Att1	I am interested in taking part in the festive event.
		Att2	This festive events make me happy.
		Att3	It is very important for me to attend this festive event.
	Centrality	Cen1	I found that my life is intertwined with this festive event.
		Cen2	I enjoy talking about this festive event with my friend.
		Cen3	My friends and I like to go to this festive event often.
	Self-Expression	Exp1	I am able to inform others about this festive event.
		Exp2	This festive event makes it possible for me to express my own style.
		Exp3	When I attended this festive event, I was glad that other people saw me.
	Place Dependence	Rel1	I prefer going to this place rather than other tourist attractions.
		Rel2	This festival gives me a greater sense of satisfaction compared with other festivals.
		Rel3	This festival cannot be replaced by other festival-based tourism.
	Place Identity	Ide1	This festive event means so much for me.
		Ide2	I strongly identify with this festive event.
		Ide3	I feel like I belong to this festive event.

Table 2. *Cont.*

Dimension		Code	Item
Travel Motivation	Physiological	Phy1	The festival event allowed me to have a unique experience and satisfied my curiosity.
		Phy2	This festival event showed me some historical outfits.
		Phy3	This festival event gives me the opportunity to learn about and discover traditional culture.
	Safety	Safe1	The safety of this festive event will have a bearing on my desire to travel.
		Safe2	This festive event enables me to travel in a casual environment.
		Safe3	As a participant in this festival event, I feel safe.
	Love and Belonging	Soc1	This festival event is my chance to engage with people and meet new friends.
		Soc2	This festival gives me the opportunity to express my ideas and expertise to other people.
		Soc3	This festival event makes it possible for me to win the respect of others.
	Esteem	Res1	This festive event can satisfy my aesthetic research and learning new knowledge.
		Res2	This festival gave me an opportunity to get to know myself better.
		Res3	This festival event lets me realize personal fulfillment and prestige.
	Self-Actualization	Self1	This festive event calms, calms or releases the person's emotional level.
		Self2	This festive event increases personal capacity and vision.
		Self3	This festival helps me to reduce mental stress, stress and frustration.
Behavioral Intention	Intention to Participate	Int1	I went to this festival because I love the culture.
		Int2	I will purchase products related to this festival event.
		Int3	I'll be looking for information on this festival event.
	Repeated Behavior	Rep1	I'm getting back to this festival event.
		Rep2	I will again purchase the products associated with this festival event.
		Rep3	I'm prepared to pay more for this festival event.
	Suggestive Behavior	Rec1	I would recommend this festival event to anyone else.
		Rec2	I want everyone to know that I took part in this festival event.
		Rec3	I will be encouraging my friends to attend this festival event.

4. Results and Discussion

All respondents were between the ages of 20 and 35 years, and 288 respondents completed the defined tasks. After omitting the invalid or unanswered questionnaires, 238 remained. The respondents were preponderantly female (37 male and 201 female). A survey conducted by PIXNET in 2014 indicated that over 60% of women were interested in Yue Lao Temples, particularly single individuals in the age groups "20 or younger" and "21 to 25". [51]. These statistics were consistent with the predominant demographics of the recovered questionnaires. The results of an independent-sample *t*-test showed no significant statistical differences in the gender variable under different constructs, suggesting that the gender discrepancy of the data was unlikely to produce bias. A questionnaire pre-test was unnecessary because the questionnaire administered in this study was developed based on expert theories. Therefore, the questionnaire had a high expert validity score. A confirmatory factor analysis also showed that the questionnaire met validity and reliability standards.

4.1. Confirmatory Factor Analysis

4.1.1. Convergent and Discrimination Validity

The author conducted a confirmatory factor analysis (CFA) to measure the convergent validity and discriminant validity of the questionnaire (see Tables 3 and 4). The CFA was based on 238 valid responses and measured the covariance between the observed and latent variables.

Table 3. Confirmatory factor analysis of model (n = 238).

Dimension	*M*	*SD*	*SK*	*KU*	*SFL*	*SMC*	*EV*	*CR*	*AVE*
Experience Design								0.876	0.639
Entertainment	5.990	0.784	−0.577	−0.312	0.745	0.555	0.271		
Educational	5.340	1.029	−0.325	−0.524	0.850	0.722	0.298		
Esthetic	5.983	0.839	−0.764	−0.144	0.769	0.591	0.283		
Escapist	5.549	0.995	−0.356	−0.620	0.828	0.685	0.315		
Cultural Emotion								0.946	0.779
Attraction	5.583	0.964	−0.392	−0.532	0.877	0.770	0.215		
Centrality	5.248	1.157	−0.365	−0.537	0.866	0.749	0.338		
Self-Expression	5.362	1.071	−0.256	−0.792	0.890	0.793	0.240		
Place Dependence	5.241	1.152	−0.438	−0.425	0.894	0.800	0.269		
Place Identity	4.954	1.223	−0.179	−0.754	0.885	0.784	0.328		
Travel Motivation								0.937	0.748
Physiological	5.740	0.947	−0.515	−0.444	0.826	0.682	0.279		
Safety	5.515	0.998	−0.331	−0.406	0.839	0.703	0.298		
Love and Belonging	5.189	1.171	−0.251	−0.568	0.877	0.769	0.320		
Esteem	5.211	1.088	−0.146	−0.727	0.911	0.829	0.205		
Self-Actualization	5.385	1.101	−0.310	−0.453	0.868	0.754	0.301		
Behavioral Intentions								0.935	0.827
Intention to Participate	5.218	1.171	−0.445	−0.213	0.928	0.862	0.191		
Repeated Behavior	5.028	1.197	--0.243	−0.539	0.944	0.891	0.158		
Suggestive Behavior	5.501	1.080	−0.460	−0.236	0.854	0.730	0.319		
Mardia	100.087			$p(p + 2) = 17(17 + 2) = 323$					

Note: *M* = mean; *SD* = standard deviation; *SK* = skewness; *KU* = kurtosis; *SFL* = standardized factor loading; *SMC* = square multiple correlation; *EV* = equipment variation; *CR* = composite reliability; *AVE* = average variance extracted; p = number of variables.

Table 4. Discriminant validity (n = 238).

Dimension	Number of Items	Correlation Coefficient			
		Experience Design	Cultural Emotion	Travel Motivation	Behavioral Intentions
Experience Design	4	0.799			
Cultural Emotion	5	0.805 **	0.882		
Travel Motivation	5	0.793 **	0.850 **	0.865	
Behavioral Intentions	3	0.729 **	0.838 **	0.856 **	0.910

Note: variable mean = summed average of all items in the scale; the value of the diagonal line is the square root of the average variance extracted (AVE) for this latent variable; when the significant level $\alpha = 0.05$, the correlation coefficient between the variables reaches the significant level. ** $p < 0.01$.

According to the CFA's standardized factor loadings (SFLs), the factor loadings for experience design, cultural emotion, travel motivation, and behavioral intention were 0.745–0.850, 0.866–0.894, 0.826–0.911, and 0.854–0.944, respectively. The SFL for each item was less than 0.6, thus deeming the questionnaire acceptable. According to Bagozzi and Yi [52], the composite reliability and AVE should be greater than 0.60 and 0.50, respectively. The composite reliability for each dimension in this study was between 0.876 and 0.956, and the AVE was 0.639–0.827. Thus, the questionnaire had acceptable internal consistency.

If a correlation analysis reports a weak correlation between two constructions, then they are said to have discriminating validity [53,54]. This study considered dimensions to have discriminant validity when more than 75% of the square roots of the AVE were greater

than the correlation coefficient of the dimension [55]. The diagonally presented values revealed that the square root of AVE for each dimension was 0.799–0.910. In addition, 75% of the square roots of the AVE were greater than the correlation coefficient of each dimension (Table 4). Thus, the questionnaire had discriminant validity.

4.1.2. Multivariate Normality Tests

Following the integration of the observed variables, multivariate normality tests were conducted to explore the variables' normality. Normality is defined by the coefficients of skewness and kurtosis. The observed variables are said to be normally distributed if the absolute value of the skewness and kurtosis is less than 2 [56]. The absolute values for the skewness and kurtosis of all observed variables (items) in each dimension of the structural equation model were less than 2, indicating normal distribution. The multivariate normality test employed Mardia's coefficient—a multivariate kurtosis index widely used to identify multivariate normality—to determine multivariate kurtosis. The data have multivariate normality if the coefficient is less than p (p + 2), where p is the number of observed variables [57]. Mardia's coefficient for this study was 100.087, and p (p + 2) was estimated at 323 and greater than Mardia's coefficient. Thus, the data had multivariate normal distribution. See Table 3 for the CFA and its results.

4.2. Structural Model Analysis and Hypotheses Verification

This study employed structural equation models to verify the model and research hypotheses. More specifically, it aimed to demonstrate the measured effects between the latent and observed variables and determine the causal relationships among the latent variables. The final model comprised 4 dimensions, 17 observed variables, and 51 items.

The test for the model's goodness of fit indicated that the specific values for the chi-square and degree of freedom were between 1 and 5 ($\chi 2 \div df = 3.34$); thus, both conformed to the testing standards. AGFI = 0.782 was within the acceptable range, and other indices also conformed to the testing standards (RMR = 0.048 < 0.08, GFI = 0.846 > 0.8, PGFI = 0.591 > 0.5, NFI = 0.922 > 0.8, RFI = 0.902 > 0.9, IFI = 0.944 > 0.9, NNFI (TLI) = 0.929 > 0.9, CFI = 0.944 > 0.9, PRATIO = 0.794 > 0.5, PNFI = 0.732 > 0.5, PCFI = 0.750 > 0.5, RMSEA = 0.099). The standards adopted for evaluating the structural model were based on the χ^2/df value of $\leqq 5$ proposed by Schumacker and Lomax (2004); the goodness-of-fit index (GFI) of between 0.8 and 0.89 proposed by Doll, Xia, and Torkzadeh (1994); the root mean square error of approximation (RMSEA) value of $\leqq 0.1$ proposed by Browne and Cudeck [58]; the normed fit index (NFI) of $\geqq 0.8$ proposed by Ullman; and other indices recommended by Hair, Anderson, Tatham, and Black [55,59].

Figure 5 illustrates the path diagram, and Table 5 presents the results for the structural model analysis. The results suggested that H1, H2, H4, H5, and H6 were supported, whereas H3 was not. According to the model path coefficients, the path coefficient from experience design to travel motivation was 0.44 (direct impact) and that from experience design to travel motivation via cultural emotion was 0.45 (0.91×0.50; indirect impact), for an overall impact of $0.44 + (0.91 \times 0.50) = 0.44 + 0.45 = 0.89 > 0.44$ (overall impact > direct impact). All of the path coefficients achieved statistical significance. Therefore, H7 was supported. Finally, the path coefficient from experience design to behavioral intention was -0.30 (direct impact) and that from experience design to behavioral intention via cultural emotion was 0.47 (0.91×0.52; indirect impact), for an overall impact of $-0.30 + (0.91 \times 0.52) = -0.30 + 0.47 = 0.17 > -0.30$. All of the path coefficients achieved statistical significance. Therefore, H8 was supported. An observation of the various constructs of the SEM and the standardized regression coefficients (factor loadings) of the measured variables revealed that, besides entertainment (0.74) and aesthetics (0.77) in the experience design construct, all other variables achieved a factor loading of 0.8 or higher. These results indicated that the variables were highly influential. Therefore, they should be included in future discussions and practices.

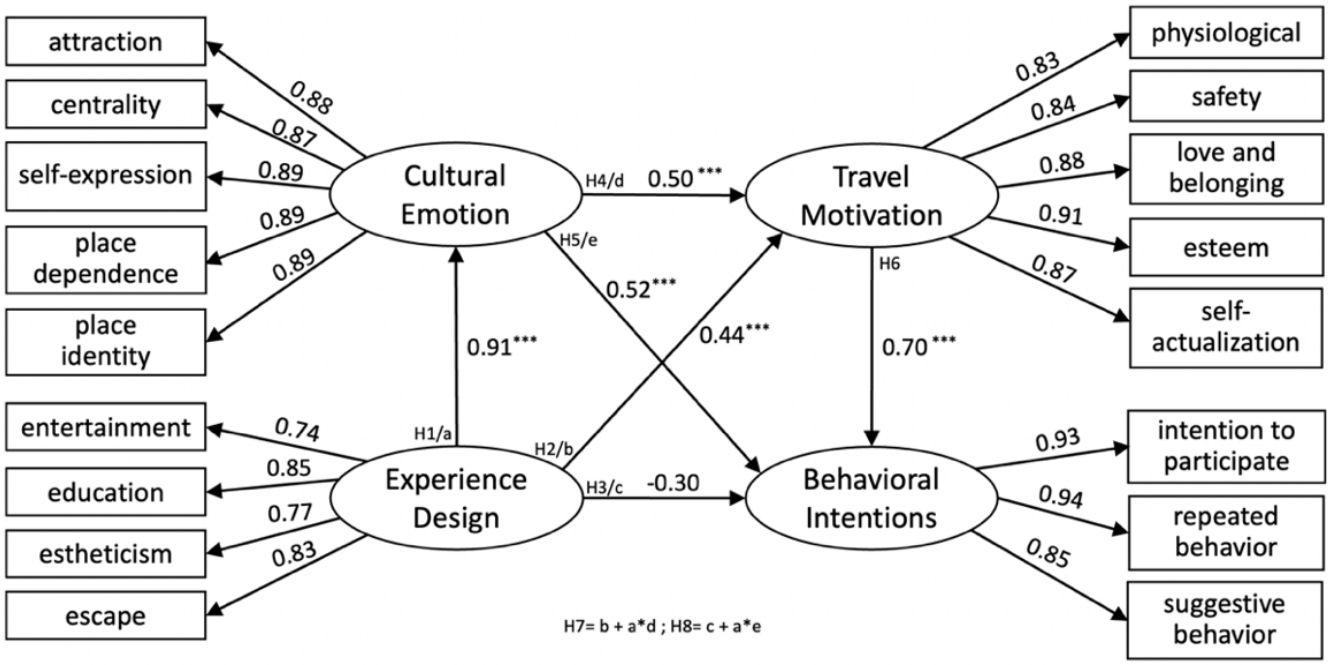

Figure 5. The path diagram and analysis of the structural model. *** $p < 0.001$.

Table 5. The analysis of the structural model (n = 238).

	Variable	Path Coefficient	*CR*	*p*	Hypotheses Verification
H1	Experience Design -> Cultural Emotion	0.91	16.560	***	Supported
H2	Experience Design -> Travel Motivation	0.44	3.579	***	Supported
H3	Experience Design -> Behavioral Intentions	−0.30	−2.180	*	Not supported
H4	Cultural Emotion -> Travel Motivation	0.50	4.137	***	Supported
H5	Cultural Emotion -> Behavioral Intentions	0.52	4.079	***	Supported
H6	Travel Motivation -> Behavioral Intentions	0.70	6.386	***	Supported
H7	Experience Design -> Cultural Emotion -> Travel Motivation	0.44 + (0.91 × 0.50) = 0.44 + 0.45 = 0.89 > 0.44			Supported
H8	Experience Design -> Cultural Emotion -> Behavioral Intentions	−0.30 + (0.91 × 0.52) = −0.30 + 0.47 = 0.17 > −0.30			Supported

* $p < 0.05$, *** $p < 0.001$.

4.3. Preferences and Experience Designs of the Research Event

Through multiple-choice questions, the respondents were asked to select their preferred events. The data showed that the most preferred events were the Discount Coupons (event8/hybrid), Old School Date Special Exhibition (event6/in-person), and Matchmaking Raffle (event9/hybrid), as illustrated in Figure 6. We then compared the average importance of the experience design elements of the three types of events (3 virtual, 3 in-person, and 11 hybrid). An ANOVA was performed to analyze the data. Levene test results indicated that only the distance element of experience design failed to achieve statistical significance. All other elements in the entertainment, education, and aesthetics constructs

achieve statistical significance, suggesting that the three event types were significantly different. The results also indicated that, in the case of the entertainment construct, the respondents mostly preferred the hybrid events, followed by the in-person events, and, lastly, the virtual events. In the case of the education construct, the most preferred were the virtual events, followed by the in-person events, and, finally, the hybrid events. In the case of the aesthetics construct, the most preferred were hybrid events, followed by virtual events, and, finally, in-person events, as tabulated in Table 6. Overall, the respondents preferred hybrid events for entertainment and aesthetics.

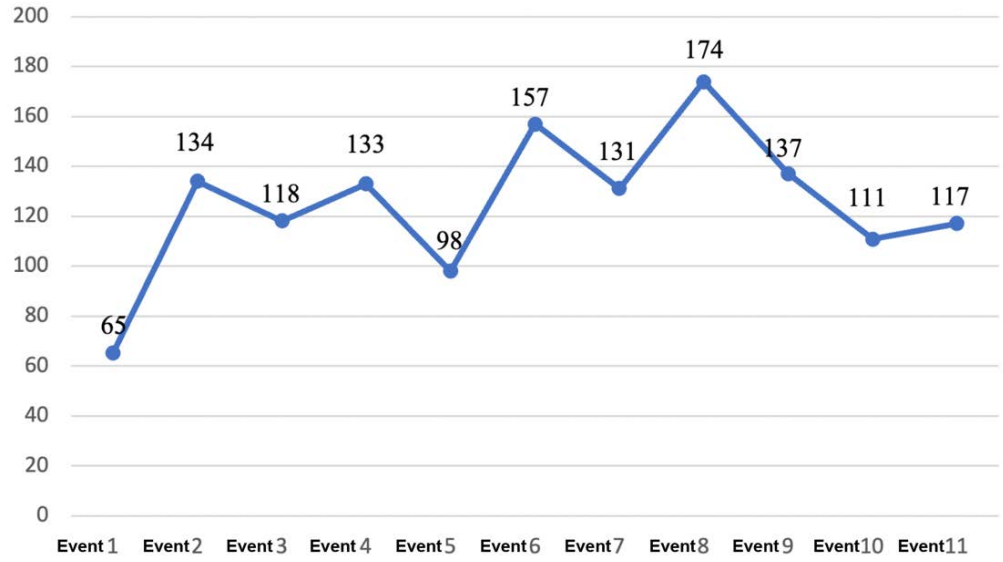

Figure 6. Event content preferences for research cases.

Table 6. Mean, standard deviation, and F-test summary of experience design components of "different event types" (n = 238).

Experience Factor	Source of Variation	SS	DF	MS	F	Type	M	SD
Entertaining	Between groups	13.8	2	6.90	10.87 ***	Virtual	5.65	0.77
	Within groups	451.2	711	0.64		In-person	5.84	0.83
	Total	465.0	713			Hybrid	5.99	0.78
Educational	Between groups	31.4	2	15.70	18.31 ***	Virtual	5.25	0.92
	Within groups	610.0	711	0.86		In-person	5.17	1.03
	Total	641.4	713			Hybrid	4.77	0.82
Aesthetic	Between groups	9.6	2	4.82	7.437 **	Virtual	5.78	0.78
	Within groups	460.8	711	0.65		In-person	5.70	0.80
	Total	470.5	713			Hybrid	5.98	0.84
Escapist	Between groups	3.4	2	1.68	1.846	Virtual	5.41	0.91
	Within groups	647.9	711	0.91		In-person	5.40	0.96
	Total	651.2	713			Hybrid	5.55	0.99

** $p < 0.01$, *** $p < 0.001$.

5. Conclusions and Suggestions

It is vital that people value tradition and local culture. Such value translates to people's spiritual beliefs. Through the organization of and participation in festive events, future generations can learn the true value of preserving tradition and be motivate to take up the mantle of cultural preservation. Based on literature research, theoretical model construction, and analysis, this paper began with an exploration of the literature and

designed a structural model to validate consumers' expectations and conceptions of the 2021 Tainan Chihsi Festival. The analysis results collected in this study serve as a reference for cultural festival events for future researchers and event organizers. The conclusions of this study are presented below.

1. We conducted a questionnaire survey to examine the effects that the experience designs of festive events have on cultural emotion, travel motivation, and behavioral intention. The goodness-of-fit results verified the feasibility of the proposed Festival Experience Design Influence Model and its value for future research and applications.
2. The experience designs examined in this study significantly and positively influenced the respondents' cultural emotions and travel motivations. However, they did not significantly impact participatory intentions, revisitation willingness, recommendation behavior, and other behavioral intentions, suggesting that, although the event content and implications resonated with the respondents, they did not evoke subsequent behaviors. This conclusion reflects the behavioral intentions at the outermost layer of the conceptual map proposed in this study. It suggests that experience designs alone are unlikely to prompt people to overlook their cultural emotions and travel motivations and directly enter decision-making behaviors. Bastiaansen et al. [60] and Rodríguez-Campo et al. [61] mention that events must be designed in such a way that they resonate with people emotionally in order to evoke behavioral shifts. The results show that cultural emotion significantly and positively influenced the respondents' travel motivations and behavioral intentions, suggesting that attractive, people-centered, and highly relatable events satisfied participants' physiological, safety, love and belonging, esteem, and self-actualization needs and, consequently, evoked their participatory intentions, revisitation willingness, recommendation behavior, and other behavioral intentions. The results also show that cultural emotion mediated the relationship between experience design and travel motivation and between experience design and behavioral intention, suggesting that the culture and emotion of festive events are unique and necessary and impact participants' participatory intentions and behaviors.
3. The results indicated that the respondents most preferred the hybrid events for entertainment and aesthetics and that both the in-person and virtual events contained educational elements. The primary reasons for the high scores in the education construct for the virtual events were the ease of access via smartphone, ease of application, and personal interaction. By comparison, the main reason for the low scores in the education construct for the in-person events was that learners are easily distracted in in-person events.

Overall, an influential festival event must be designed around cultural emotion. In other words, the experience design must include cultural emotion to influence participants' travel motivations and behavioral intentions.

Future event planners designing events can consider focusing on personal elements and multi-faceted learning when designing virtual experiences for festive events, while in-person events should focus on interactivity and entertainment. Ideally, experience designs should contain a good mix of in-person and virtual elements or events interspersed with individual and group activities. In addition to originality, organizers can consider incorporating various emotional elements to enhance the experiences of festive events. Culture promotes interaction between locals and visitors and creates shared experiences. It also allows events to transcend the spatial limitations of the venue, diversify the cityscape, create different environments, and strengthen communication. Two limitations in this study were the questionnaire delivery method and the single case study. First, because the questionnaire was administered online, there were some discrepancies in respondent location, age, and occupation. Therefore, we were unable to perform relevant demographic analyses. Second, because this study referred to a single case study with a limited number of respondents, we were unable to conduct the relevant analyses of cultural and regional differences. We recommend that future studies expand the scope of analysis to include

respondents from various ethnic backgrounds and festive events from different regions to explain the effects on the preferences of the participants and the design factors of the experience during different festive events. Amid modernization, the world is increasingly subject to new and exigent economic challenges. As the consumption environment continues to evolve, vendors must seek ways to integrate cultural content and design innovation to add value to their products and services. Organizers can reference the findings of this study to plan festive events that are more in line with consumer expectations, differentiate festive events from other community events, and add uniqueness and originality to their events. Researchers can also apply the results of this study to expand the disciplines of education and design.

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Institutional Review Board Statement: The study gained ethics approval from National Taiwan University (NTUREC No: 201806ES073) prior to data collection.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data sharing not applicable.

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Eliciting Brand Loyalty with Elements of Customer Experience: A Case Study on the Creative Life Industry

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Abstract: The Creative Life Industry (CLI) is an experiential industry within the experience economy in Taiwan. Given the scarcity of research on the realms of experience and brand loyalty within this field of the CLI, this study aims to further our understanding of how designing valuable realms of experience can generate brand loyalty in customers. Employing a qualitative research method, the present study focuses on how the CLI is experienced. Data were collected using in-depth semi-structured interviews with 20 customers and through observations; secondary data at two CLI sites in Taiwan were also used. The findings indicate that many elements play a role within the realms of experience in CLI businesses. These include cultural experience interest, relaxing and entertaining programs, guided tours with educational and esthetic meaning, living esthetic program relatability, architectural style and esthetics, fashionable product design, living design different from routine life, and uniqueness of service facilities. Moreover, elements of escapist and esthetic experiences have more significant effects on brand loyalty than other types of experience. The theoretical and practical implications are provided for CLI businesses and researchers.

Keywords: experience economy; customer experience; creative life industry; cultural and creative industries; brand loyalty

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1. Introduction

Pine and Gilmore [1,2] launched the experience economy theory, which is a widely applied concept within academic research, such as in the tourism, arts and culture, and cultural and creative industries. The authors claimed that there are four stages of evolution in an economy, namely commodities, goods, services and experiences. In this regard, Pine and Gilmore [1,2] suggested four realms of experience, namely entertainment, education, esthetics, and escapism (4Es), which imply different degrees of individuals' participation in and connection to an experience. Experience-oriented businesses regard services as stages and products as props, which encourages customers to participate in products and services to generate great experiential value and memories.

In 2002, the Creative Life Industry was promoted as one of the cultural and creative industries by the Taiwanese government. Regarding the experience economy, the Creative Life Industry is also seen to be an experiential industry, which is proposed to orchestrate memorable experiences for its customers through the design of products, services, activities and spaces. In Taiwan, the term 'Creative Life Industry (CLI)' is defined as an industry that uses creativity to integrate core knowledge of the life industry and provide in-depth experiences and high-quality esthetics. A CLI business is certified by the Taiwanese government. The four realms of experience by Pine and Gilmore [1,2], namely entertainment, education, esthetics and escapism, are included in the selection of a CLI business.

Most 4Es studies have used a survey research design and quantitative data analysis techniques, such as structural equation modeling, correlation, etc. The realms of experience should be studied in tourism, such as in golf, mountain or nature-based tourism [3], or in theme parks [4]. The framework of 4Es has been applied in wine tourism [5], casinos [6], and Airbnb accommodations [7], but limited studies have been explored in CLI.

CLI businesses are highly experiential in nature, which brings about a greater understanding of customer experiences in services. Thus, there is a need to use the experience economy to identify customer experience as one core element with which to better satisfy customers and generate brand loyalty of CLI businesses.

Brand loyalty is considered to be one of the key elements of a company's sustainable success. Furthermore, customer experience is regarded as one of the important elements leading to loyalty [8,9], and the realms of experience have different effects on loyalty [3,4,10,11]. If the realms of experience are designed in advance by CLI businesses while considering customers' expectations, experiences may be more attractive and distinctive in eliciting customers' loyalty to a certain brand. Research needs to focus on providing CLI businesses with a better understanding as to how designing experiential elements for customers can lead to stronger brand loyalty. Qualitative research on the realms of experience and on brand loyalty across CLI businesses continues to be scarce. To address this research gap, this study aims to build a framework of customer experience and brand loyalty in CLI businesses from customers' perspectives. The current study seeks to employ an in-depth analysis of the experiential elements arising from customers' participation in CLI business experiences. In addition, the relationship between elements of the realms of experience and brand loyalty will also be discussed.

The goals of this study were as follows: (i) exploring customers' perceptions of experiential elements in CLIs in Taiwan on the basis of experience economy theory to improve CLI businesses' operating results in terms of customer experiences and to extend the practical implications of experience economy theory. (ii) Constructing a framework for customer experience and brand loyalty and identifying the experiential elements leading to brand loyalty. Academically, this study contributes to the literature through extending the concepts of the experience economy to brand management and development. In practice, the results of the current study contribute to the sustainable development of CLIs through assisting operators in optimizing their customer experience design, the effects of which are reflected in extended relationships between customers and business brands.

2. Theoretical Background

2.1. Experience Economy

Customers desire unforgettable and multisensory experiences more than unadorned products and services [12]. According to Pine and Gilmore's experience economy theory [1,2], experience-based businesses stage memorable experiences instead of merely delivering intangible services. The experience economy theory is based on four realms of experience: the entertainment, educational, esthetic, and escapist realms of experience. Pine and Gilmore [13] also proposed value-creating opportunities to facilitate further progress in the evolving experience economy, such as offering mass customized goods, directing employees to act, and using digital technology to better integrate the real and the virtual.

In both customer participation (active or passive participation) and customers' connection with the surrounding environment (absorption or immersion), entertainment experiences are generated when customers participate passively and absorb the event [1,2]. Entertainment is highly pervasive and offers attractive experiences in business offerings [1,2]. Thus, entertainment experiences can improve or enrich holistic experiences [14]. Educational experiences are produced when customers actively participate and are highly absorbed in the events. Esthetic experiences are explained through passive participation and deep immersion. In esthetic experiences, customers typically participate passively and have no interaction with the surrounding environment [15]. Escapist experiences are generated when customers are actively involved and immersed in the events. A sweet spot occurs when the four realms of experience are harmonized and integrated [2].

Based on the experience economy theory, Oh, Fiore, and Jeoung [15] conducted empirical research on measuring the four realms of experience (entertainment, education, esthetics and escapism). The theory was later adopted by researchers exploring leisure and tourism topics, in settings such as cruises [10], zoos [16], the luxury cruise industry [17],

movie festivals [18], wine tourism [3], rural tourism [19], the Creative Life Industry [20], and heritage museums [21]. The aforementioned studies either discussed the measurement of the four realms of experience or explored their relationships with customer satisfaction, behavioral intention, memory, and behavioral loyalty. The quantitative measurement scale proposed by Oh et al. [15] has proven to be effective in various tourism fields, wherein customer experience and ratings between these fields can be understood and compared. Exploring the experience nature of different sectors helps to expand the applicability of theoretical frameworks related to the experience economy. In their research on heritage museums, for example, Radder and Han [21] confirmed that not all of the four realms independently influenced visitors' experiences. Instead, education and entertainment should be explored simultaneously, thereby proposing three realms that lead to positive experiences among museum visitors: edutainment, escapism and esthetics. In the tourism literature, escapism is a significant element that affects customer experiences. Researchers have proposed that tourists pursue new experiences that provide escapism from their routine life (e.g., Oh et al. [15]; Quadri-Felitti and Fiore [3]; Hwang and Han [17]). Hwang and Han [17] investigated the effect that the four realms of experience have on perception in the luxury cruise industry. Their results indicated that all four realms of experience positively affect brand prestige and loyalty.

Few qualitative studies have explored the nature of experiences and expanded the knowledge of the experience economy theory in different settings, such as wine tours [5], casinos [6], and Airbnb accommodations [7]. Alternatively, Chang [22] discussed the four-realm-based-experience design from enterprise perspectives.

Adopting the experience economy as the framework, Quadri-Felitti and Fiore [5] analyzed literature on wine tourism and proposed the nature of experience constructs. To small business owners in rural areas, the study allowed them to devise strategies as per the proposed experience construct combinations. Shim, Oh, and Jeong [6], by examining the perceived experience of casinos in contemporary South Korea, proposed that casinos were successful in designing the entertainment experiences. According to Bao et al.'s [7] study, esthetics were considered to be an important experience, but educational, entertainment, and escapist experiences seemed to be very limited in Airbnb accommodations in Hangzhou, China.

The aforementioned studies explored the experience nature of specific industries through the use of qualitative methods, thereby helping tourism operators to develop respective strategies. Academically, these studies have broadened the theoretical knowledge of the experience economy. For example, Quadri-Felitti and Fiore [5] confirmed that the esthetic experiences in a wine tour are created by the surrounding countryside landscape, unique accommodation experience, as well as winemaking art and techniques, while the esthetic experiences derived from casinos are decided by the additional services provided for free, such as catering and shows [6]. Shim et al. [6] argued that educational experience was the least relevant for the casino tourism. The authors also suggested that in order to offer "sweet spots", it is a need to design more educational experiences for visitors to learn responsible gambling.

The aforementioned studies demonstrated differences in the perceived experience nature between different industries. Therefore, how to formulate desirable experience perceptions among customers warrants further investigation.

2.2. Customer Experience and Brand Loyalty

Loyalty refers to a long-term attachment to repurchase a brand rather than simple repurchasing [23]. According to Oliver [24] (p. 34), loyalty is defined as "a deeply held commitment to re-buy or re-patronize a preferred product or service in the future, by a consistent purchase of a particular brand, despite situational influences and marketing efforts having the potential to cause switching behaviour". Behavioral intention refers to customers' intended behavior, which is an important component of loyalty [25]. Fishbein and Ajzen [26] defined behavioral intention as one's specific planned behavior and their

likelihood of action based on individuals' expectations, which can be used to predict behaviors. In addition, Zeithaml, Berry, and Parasuraman [27] proposed five dimensions with which to measure behavioral intention, namely positive word of mouth (WOM), recommendations, loyalty maintenance, spending more money, and paying premium prices. In research on tourism, revisit intention is an important dimension of loyalty that describes customers' behavioral intentions to visit a destination, good, or brand again in the future [28]. Chen and Chen [29] claimed that customer loyalty is a primary goal in ensuring the sustainability of a firm.

Aaker [30] (p. 44–p. 45) proposed that "brand loyalty, long a central construct in marketing, is a measure of the attachment that a customer has to a brand. It reflects how likely a customer will be to switch to another brand, especially when that brand makes a change, either in price or in product feature". Aaker [30] and Oliver [24] focused on the possibility of consumers switching their behavior toward a brand, reflecting their attachment toward the brand. Keller [31] proposed that the characteristics of brand loyalty, in addition to behavioral loyalty, also include attachment toward a brand, active engagement, and attitudinal loyalty.

Brand loyalty consists of two dimensions, namely behavioral loyalty and attitudinal loyalty [32–36]. In terms of the behavioral perspective, a consumer's behavioral loyalty refers to the customer's frequency of repurchase choices or their relative volume of purchasing the same brand. In tourism, behavioral loyalty would refer to the frequency of repeat visits. From an attitudinal perspective, attitudinal loyalty is concerned with a customer's intention toward a brand. Attitudinal loyalty is illustrated by an intention to visit and by positive recommendations. Reviewing the brand loyalty in Aaker [30] and Keller [37,38], attitudinal loyalty toward a brand is the dependent construct within this study. For the Creative Life Industry, attitudinal brand loyalty is a more appropriate dimension of loyalty than is repeat visitation. Previous research has suggested that tourists can be loyal toward a destination even if they cannot visit the destination repeatedly [39–41]. In this study, attitudinal brand loyalty refers to positive feelings toward a CLI business destination.

Mascarenhas, Kesavan, and Bernacchi [8] pointed out that a growing number of businesses are designing customer experiences to strengthen and sustain enduring lasting customer loyalty. The four realms of experience were employed in cruise experiences, and the results showed that customers' esthetic experiences had the biggest impact on their memories of and loyalty toward a cruise [10]. Quadri-Felitti and Fiore [5] employed the four realms of experience in explaining the experiential nature of wine tourism. The authors proposed that fulfilling the four realms will lead to customers' intentions to revisit and recommend a wine destination. Ali, Hussain, and Ragavan [11] also applied the realms of experience within a hotel and found that all realms positively influenced customers' memories and loyalty. Reviewing literature, this study finds that the four realms of experience proposed by Pine and Gilmore [1,2,13] may have different impacts on customers' loyalty in different businesses.

In the marketing context, scholars proposed that customer experience plays an important role in affecting brand loyalty [1,2,8,9,13], while the effects of the four realms of experience may lead to different effects on brand loyalty. While some studies have found the impact of the four realms of experience upon loyalty, there is still a gap in research on how the four realms of experience can lead to brand loyalty. To bridge the research gap, research needs to focus on providing CLI operators with a better understanding as to how designing valuable realms of experience for customers can lead to stronger brand loyalty.

2.3. Customer Experience and Creative Life Industry

The CLI is a special category in the cultural and creative industry in Taiwan. In the early 2000s, the Taiwanese government changed its strategies from export-oriented strategies to domestic-market-oriented strategies. The government encouraged different industries to transition from manufacturing and production orientations to life and design

orientations. The goal is to provide people with products or services that facilitate quality life experiences and that guide the continual innovation of industries.

Regarding the experience economy perspective [1,2], CLI-related strategies have been proposed to center on customer experience designs and to encourage practitioners to use local features and cultural elements combined with creative, technological, and esthetic elements to contribute to the core knowledge of the industry. Through products and spatial design, high-quality and esthetic services and activity designs are propagated to enable consumers to engage fully in experiences and to create customer experience value. In the CLI, some farm owners convert their land into tourist farms where visitors can experience agricultural life through food and farming education, ecological interpretation, and experiential lodging. The ceramic industry is declining because of increasing land and labor costs. Some businesses have therefore converted their factories into museums or leisure parks to preserve industrial culture and to enable tourists to participate in ceramic making, ceramic painting, workshops, and creative art demonstrations. These industries and businesses represent the development of Taiwanese traditions and its society and cultures as well as the innovation of economic activities.

According to Pine and Gilmore [1,2], entertainment essentially stimulates a "desire to enjoy" among people. Entertainment experiences are generated through passive participation as well as absorption in specific events or settings. CLI businesses generally offer entertainment experiences to consumers, such as on-site visits, artistic performances, and demonstrations by tea sommeliers. Educational experiences stimulate a "desire to learn" among people, reflected in spontaneous participation undertaken to acquire specific knowledge, abilities, or skills. CLI businesses provide diversified programs of learning experiences, such as DIY activities, as well as culinary arts activities and tea sessions for tourists, thereby providing tourists with enriched value for their life and personal growth.

Esthetic experiences stimulate people's "desire to be there," reflected in their passive participation and immersion in an event or environment. Experiences are created as a result of the sensory attraction of a particular event or environment. In CLI business operation, natural environments or artificial esthetic designs (such as buildings with distinguishing features, natural landscapes, displays and presentations, and revitalized spaces) are deployed to encourage tourists to immerse themselves in specific environments or events. Escapist experiences stimulate people's "desire to do or go" and require their active participation. Compared with entertainment and education experiences, escapist experiences require a greater degree of immersion and participation. Some CLI businesses provide tourists with experience programs that are distinct from routine life and encourage tourists to actively participate in escapist experiences with high degrees of immersion, achieving deeper tourist–brand identification. Such experiences for tourists include enjoying an herb-based aromatherapy session in a vanilla-scented environment, selecting fresh ingredients from a farm and participating in a cooking class, and experiencing and exploring Chinese garden-style lodging spaces, which differ from modern mainstream architecture. Arguments based on the experience economy have been integrated as an aspect of the Taiwanese government's industry promotion. Moreover, they have been practically implemented by various CLI businesses and have yielded favorable operating results.

Studies related to the CLI in Taiwan have rarely explored the effects of experience or cultural elements on the transformation of the traditional craft industry [42]. Studies have used qualitative designs to explore elements of tourists' experiences with different types of CLI businesses and the development of CLI in given areas [43–45]. A quantitative study has been conducted to examine the relationship between customer experience and customer behavioral intention [20]. Additionally, researchers have incorporated service design tools from an enterprise perspective to explore realms of experience [46] and investigate experience design strategies for different businesses [22].

Creating quality life experiences is a characteristic of CLI commodity values. In a review of relevant studies, this study identified a gradual increase in the demand for experience design or the balance between constituents, experience realms, and customer

experience. Relevant studies have tended toward focusing on specific industries. The results revealed the experience characteristics of different industries. To address the question of how to provide experiences catering to customer desire to increase customer loyalty, this study adopted an experience realm based on experience economy theory to explore elements that promote brand loyalty.

3. Materials and Methods

Few empirical studies have investigated the effects of brand loyalty and the realms of experience that shape the customer's perspective in CLI businesses. Exploratory research is suitable for examining complex, undertheorized phenomena [47].

Case studies are suitable for understanding the why and how of a problem at the exploratory stage. On the basis of a specific description of the case situation and problem statement, data are systematically collected and analyzed, facilitating an understanding of the phenomenon and context of the case [48]. In Taiwan's cultural and creative industry category, CLIs have particular features. Because of the scarcity of related studies, research on the elements associated with customer experiences offered by CLIs and their effect on brand loyalty remains at an exploratory stage. Therefore, case studies constitute a suitable approach for this research. To collect more robust research data, this study focused on the cases of two businesses that had won the "CLI Business Excellence" award. The similarities in their business models and customer attributes are conducive to establishing the theoretical foundation of this study [49].

This study used qualitative content analysis to obtain connotations, concepts, and topics from CLI customers' experiences. Content analysis is a documentary research method applied to describe and quantify phenomena [50]. Many studies have adopted qualitative content analysis to explore texts, including interview documents, newspapers, and diaries, from scientific and subjective perspectives. Content analysis enables researchers to test theoretical problems and enhances understanding of data [51]. During data analysis, forming concepts or variables on the basis of theory or related studies is useful for qualitative studies. The present study used the experience economy and brand loyalty theory as the structural theme of the content analysis to form the basis of theoretical knowledge. In the CLI, customer experience and brand loyalty constitute research topics that require theoretical support. Therefore, case-based content analysis is a suitable method [48].

3.1. Research Sites

The research subject within this study is that of CLI businesses that focus on lifestyle design. This study invited two themed CLI businesses, namely The One Nanyuan Land of Retreat & Wellness (The One Nanyuan) and Gaeavilla Resort, to participate in this study on the performance of CLI businesses. The One Nanyuan and Gaeavilla Resort won the "Excellent CLI Business" award from the Taiwanese government.

Constructed in 1985, with a Chinese garden combining different styles (i.e., architectural styles of Jiangnan [China], Taiwanese Minnan culture, and the Baroque period), The One Nanyuan transformed into a hotel resort in 2008. The One Nanyuan was Taiwan's first cultural leisure park to win Japan's Good Design Award. Focusing on a lifestyle featuring East Asian esthetics, the business offers accommodation with East Asian interior design, catering services with East Asian utensils, and a garden tour provided by personal butlers. Customers can experience traditional Jiangnan-style and Hakka-style architecture, art exhibitions, and cuisine, such as Hakka flat noodles, rice vermicelli, and traditional desserts [52].

Having run an organic vanilla farm for three decades, the founders of Gaeavilla Resort gave it its famous vanilla flower-inspired esthetics. The herb farm in the Gaeavilla Resort is certified as the first leisure farm in Taiwan. Gaeavilla Resort exemplifies eco-friendly construction, complemented with an organic herb farm [53]. The business offers a tour of its vanilla herb farm, accommodations, private organic herbal remedy space featuring

organic cuisine, vanilla-based foodstuffs, daily necessities, and vanilla-related experiences and activities.

The two resorts selected in this study have the following similarities: (i) both resorts have their unique thematic styles. The Gaeavilla Resort features vanilla life esthetics, whereas The One Nanyuan features life esthetics based on neo-oriental literary culture. (ii) Both resorts provide similarly sized areas (3–4 hectares) for customer experience. (iii) Both resorts provide similar experiences, including high-quality accommodation, characteristic cuisines, guidance services, multiple experiential activities, and souvenirs. (iv) Both resorts target tourists with medium-to-high income levels, high education levels, and strong life experience intentions. (iv) Both resorts charge similarly; for example, the accommodation costs between TWD 8000 and TWD 40,000, and the average meal costs between TWD 1000 and TWD 2000. The customers of both resorts have similar attributes. However, their different locations may attract different customer groups. Thus, the present study explored the common research results between the two resorts and analyzed the possible differences.

3.2. Data Collection

Based on the research objectives of this study, data were collected on customers' experiences and on elements of loyalty from the perspective of customers. The data collection was divided into three streams: secondary data, observation of business operations, and semi-structured interviews. First, the researcher gathered documents relating to the development of the target objects, including books, the firms' websites, and social media. Moreover, the researcher collected information about the case companies, such as their business performance as reported in the media, facts about their awards, and service information and promotions announced on their official websites. This information was used for analyzing and testing the interview data.

Second, the researcher was given tours to participate in and observe the experiences designed by the target objects. The researcher observed the products, services, events, and spaces provided by the two case businesses at their respective sites. The main experiential areas were photographed and documented, and drawings were made of the services available in each case site. These materials were provided for interviewees as a reference to enable them to recall their experiences at the case sites.

Third, this study conducted interviews with customers who had visited the target objects. The interview participants included 20 customers who had visited Gaeavilla Resort or The One Nanyuan at least once in the two years preceding the study. The criteria with which to select participants within this study were based on gender, age and education, in line with the customer profile of the two study objects, as well as the participants being available to answer open-ended questions during a semi-structured interview.

This exploratory study analyzed the relationship between elements of the realms of experience and brand loyalty. To collect strong research evidence, the researcher collected two cases of information by performing semi-structured interviews that helped to establish the theoretical basis [49]. The researcher proposed relevant questions according to the interviewees' replies during the interview to compile meaningful data. The interview questions were designed by referring to literature on the experience economy and on brand loyalty. The interview questions included: (i) which realm of experience (i.e., entertainment, educational, esthetic, or escapist) do you perceive in the experience realms in the case site? (ii) Which experiential element relative to the realm of generated experience reflects these four experience realms? (iii) Which experiential elements relative to the realm of experience generated at the case site would increase customers' willingness to revisit the site or recommend it to others? Which experiential elements would increase customers' willingness to participate in events at the site and obtain brand information?

Because the interviews were long, purposive sampling should be proper for this study to effectively collect interviewees' opinions and identify empirical data [54]. Kensbock and Jennings [55] held that, rather than the sample size, purposive sampling tends to focus on

selecting individuals who will actively assist with the research in question. Individuals visiting Gaeavilla Resort or The One Nanyuan, or those participating in activities held by either one of the two businesses, were first asked about their willingness to participate in this study. The researcher prioritized those aged $\geq$20 years with a tendency to answer the interview questions actively. Being presented with service processes illustrated by the researcher through on-site observations, the interviewee was requested to recall the service provided on site. Thereafter, the interviewee was requested to decide whether or not they could answer the interview questions based on the visit experience. Those who could do so were recruited. Because the research sites were not suitable for an interview, the participants were interviewed at different times and in different locations so that they could comfortably participate in an interview. The researcher interviewed 10 individuals visiting Gaeavilla Resort and another 10 visiting The One Nanyuan, totaling 20 participants. Each interview average took 40–60 min. These interviews were recorded and transcribed verbatim.

Coding was performed as per the research sites and participants. Gaeavilla Resort was coded as C1, with the interviewed visitors being assigned a code from C1-a to C1-j. Meanwhile, The One Nanyuan was coded as C2, with the interviewed visitors being assigned a code from C2-a to C2-j. Concerning demographic information, most participants were female (fifteen women and five men). By analyzing the relevant secondary data regarding participant characteristics, the researcher determined that in similar studies, most participants are female. These participants tend to be more willing to conduct an interview than are their male counterparts, which also meets the purposive sampling requirement of selecting those more willing to answer questions [56]. When the interview data repeated and there was no new information, the data were considered to be saturated. When no new themes emerged from the research data, following data analysis, the researcher determined that the interview data had achieved the theoretical saturation stage [57].

3.3. Data Analysis

Data analysis was performed by referring to Dey [58], Elo and Kyngas [59] and Zhang and Wildemuth [60]. The interviews were transcribed and divided into smaller content-based units [58]. According to the transcripts, the relevance of each participant's answer to a question was determined for subsequent analysis and coding. Category codes were then confirmed. By referring to the theoretical bases derived from literature on the realms of experience and on brand loyalty, the researcher recognized and analyzed meaningful contents [58]. Later, attributes that appeared frequently in the transcripts were extracted so that the researcher could assess the coding consistency of each theme and ensure that the themes could fully represent the initial codes and reflect their relationships with the specified category [59]. The researcher repeatedly read the interview transcripts to determine each participant's actual concepts and assigned experience realm and brand loyalty variables to each theme.

To enhance the internal validity and reliability of the study, the researcher adopted triangulation that comprised multiple data collection methods (including participation observation at the research sites and secondary data sources). From the perspective of customers, this study discussed the design elements of the realms of experience and their relationship with brand loyalty through data collection and analysis. With interview data being the primary source, as well as on-site observation and secondary data being supplementary sources, the researcher analyzed the collected information by means of triangulation for enhanced research credibility [54].

4. Results

As presented in Table 1, the participants interviewed provided a well-balanced sample in terms of demographic characteristics to ensure the capture of a wide range of realized experiences. Table 1 shows the background information on the participants. The participants consisted of five males (25%) and fifteen females (75%). Most participants' ages ranged from 40 to 60 years or above (55%). In terms of the participants' educational background,

almost all participants held a master's degree (65%), bachelor's degree (15%) or associate degree (20%). Among the interviewees, 15 (75%) were visiting the resort for the first time, and 5 (25%) were revisiting the resort.

Table 1. Profile of the interviewed participants.

Code	Gender	Age Group	Educational Background	Numbers of Visits
C1-a	Male	40–49	Master	Once
C1-b	Female	50–59	Master	Once
C1-c	Female	50–59	Master	Once
C1-d	Male	40–49	Associate	Once
C1-e	Male	≥60	Master	More than once
C1-f	Female	30–39	Associate	Once
C1-g	Female	30–39	Associate	Once
C1-h	Female	30–39	Master	Once
C1-i	Female	30–39	Master	Once
C1-j	Female	20–29	Master	More than once
C2-a	Male	50–59	Associate	Once
C2-b	Female	50–59	Bachelor	Once
C2-c	Female	30–39	Master	Once
C2-d	Female	20–29	Master	Once
C2-e	Female	50–59	Bachelor	More than once
C2-f	Female	50–59	Master	Once
C2-g	Female	50–59	Bachelor	Once
C2-h	Male	≥60	Master	More than once
C2-i	Female	20–29	Master	More than once
C2-j	Female	20–29	Master	Once

4.1. Realms of Experience

This study identified and organized the interviewees' perceptions about their experiences. To elaborate on the themes, related texts were drawn from the interview texts and documented. Furthermore, according to the characteristics of the experience realms proposed by Pine and Gilmore [1,2], the meanings of the smaller content-based units of the interview texts were examined, themes were respectively assigned to one of the four experience dimensions, and interviewee coding corresponding to the experience realms was conducted, as illustrated in Figure 1.

Referring to Figure 1, most experiential realms recorded were escapism (N = 17) and esthetics (N = 15), followed by education (N = 9) and entertainment (N = 5). The current qualitative analysis reveals that respondents experienced the CLI business within the construct of experience proposed by Pine and Gilmore [1,2], which demonstrates the suitability of this framework in helping to understand CLI business experiences. Although each of the four realms is reflected to a different degree, according to Pine and Gilmore [1,2], the four realms of experience are not mutually exclusive.

4.1.1. Entertainment Realm

According to Pine II and Gilmore [1,2], an entertainment experience can be defined as a consumer's passive participation and absorption in the business offerings of an environment, such as watching or listening to events or performances. The entertainment realm is related to the need to enjoy. The results reveal that among the four realms of experience, the entertainment realm is rarely frequently reflected in the themed CLI businesses.

In this study, "cultural experience interest" and "relaxing and entertaining programs" were regarded as elements of the entertainment realm. Concerning cultural experience interest, the results indicate that incorporating local cultures with activity experiences, tours, and visits, and even accommodation services, tends to bring happiness to customers. For example, in The One Nanyuan, visitors enjoyed eating foods with local cultures, listening to vinyl records, using a traditional foot warmer called Tang Po Zi, and strolling in the

bamboo garden at nighttime with a traditional lamp. As participant C2-g said, "Because Tang Po Zi is a traditional [...] recreation, people now don't use it. Instead, they use hand warmers, but we can use Tang Po Zi here". Relaxing and entertaining programs refer to offerings provided by the CLI business that make people feel relaxed and happy, such as a tearoom, visiting a vanilla garden, enjoying a concert in the Kengo Kuma's Wind Eaves Pavilion, etc.

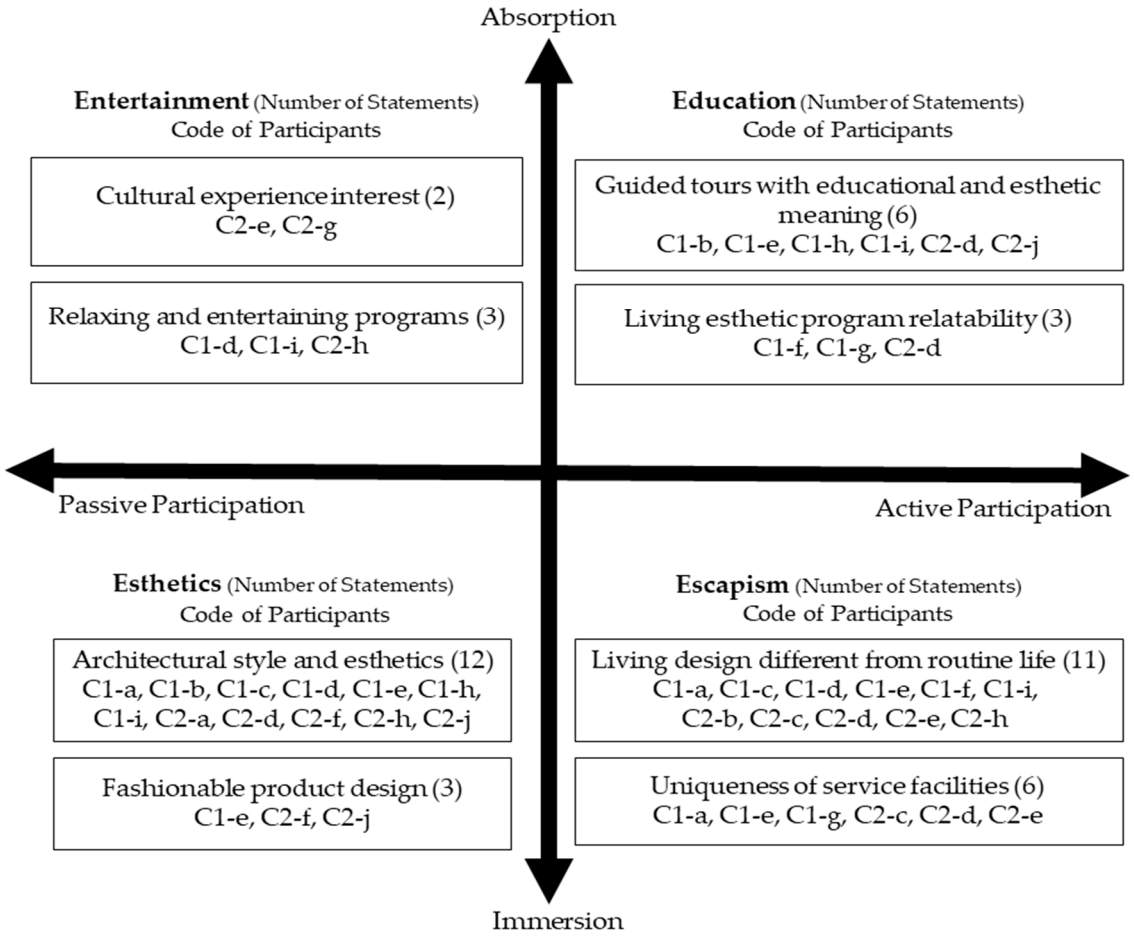

Figure 1. Four realms of experience in CLI businesses.

The "cultural experience interest" element was observed mainly in The One Nanyuan, reflecting the interest of the management in converting oriental esthetics and cultural elements into modern life experience. The "relaxing and entertaining programs" element reflected the extended visiting and performance activities of both resorts. Compared with the entertainment experience mentioned by Pine and Gilmore [1,2], the results revealed that entertainment experience elements must be presented through culturally relevant elements and correspond to the thematic characteristics of the business to communicate the entertainment value to tourists.

4.1.2. Educational Realm

An educational experience involves active participation in which customers will increase their knowledge, skill and ability by absorbing as well as actively participating in a business offering [1,2]. In this study, the most common educational activities include a guided tour of the vanilla garden, herb-food cooking events, and a guided tour of the architectural cultural esthetic.

Elements of the educational realm comprised "guided tours with educational and esthetic meaning" and "living esthetic program relatability". With regard to a guided

tour with educational and esthetic meaning, the participants gained an experience in knowledge development during a guided tour. Abundant knowledge about vanilla and about architectural cultural esthetics was frequently mentioned by the interviewees.

> "The butler tour guide told us about the origins of certain joints and buildings [...], and we have learned a lot from it." (C2-j)

> "It was an educational experience, as I am eager to learn new things. There are [in the garden] a lot of vanilla plants, which I like a lot. And I also get [to know] several vanilla varieties—[the experience was] a lesson full of knowledge." (C1-b)

> "The guide did talk about some uses of vanilla" (C1-i)

The element "living esthetic program relatability" refers to a demonstration event held by any CLI business that helps customers to broaden their knowledge, such as a demonstration inviting guests to engage in vanilla oil extraction and a cooking experience featuring vanilla cuisine. By preparing foods for and cooking vanilla dishes, the participants gained a deep understanding of the CLI business, as exemplified in this response:

> "The vanilla extraction machine looks fabulous and it made the activity special" (C1-g)

The researcher found that some customers of Gaeavilla Resort per se are fond of vanilla life esthetics, prompting them to focus on gaining more knowledge from vanilla-related leisure services. In addition to vanilla planting lessons, these customers expect to learn about facilities and equipment related to vanilla application; that is to say, they would like to be more deeply engaged in an experience for greater educational value. The study results demonstrate that education-centered experiences often come with esthetic experiences and the additional value of learning.

Education elements were observed in both resorts. Commonality was identified in "guided tours with educational and esthetic meaning" and "living esthetic program relatability" elements. For example, the learning value of participating in guided tours often entails esthetic experience. Moreover, the living esthetics of the resorts affect the routine life of the tourists. Compared with the education element proposed by Pine and Gilmore [1,2], the education experience element in the present study connected the thematic CLI esthetic goal of attracting tourists to actively participating and becoming immersed in services or events provided by the businesses.

4.1.3. Esthetic Realm

Esthetic experience represents passive participation and immersion in a sensual environment [1,2]. According to Oh et al. [15], in an esthetic experience, customers passively involve the environment with no interaction with or impact on the surroundings. In this study, some participants highlighted elements of the creative life business experience that contribute positively to immersion. The vanilla landscape of Gaeavilla Resort or the traditional architectural landscape of The One Nanyuan reflects the opportunity and has proven to be an important element for the themed CLI businesses. On the other hand, the product experience designed by the CLI business is another element with which to elicit customers' esthetic experience.

Elements of the esthetic realm comprised the spatial-design-related "architectural style and esthetics" and the "fashionable product design". Most participants assessed the architectural and spatial design esthetics of garden-based leisure businesses (i.e., Gaeavilla Resort and The One Nanyuan) according to the perceived esthetics of the landscape design integrating the building exterior and nature, the uniqueness of the architectural styles, the decorations, and the layout. In the case of Gaeavilla Resort, the participants merged into the vanilla plants and the hotel building, which blends into the surrounding natural landscape, in which the provided facilities (vanilla garden, landscaping, outdoor spa, public space, and artwork in hotel rooms) gave them an impression of simplicity that combines natural and artistic beauty. One of the participants mentioned:

> "The design of the room made me relax, where I can be alone without being bothered. Most importantly, the artwork inside and [the] outdoor spa gave me an impression of [an] extremely simple and natural esthetic design, which also helped me escape from the present [...] the room decoration was more like minimalism." (C1-c)

The escapist and esthetic elements created by Gaeavilla Resort interacted with one another and, meanwhile, improved the quality of customers' experiences. By contrast, the East Asian architectural culture and style of The One Nanyuan were major elements affecting esthetic experiences, as reported in the following statement:

> "I [could sense] the strong esthetic style here, where the guide introduced each design element of the building" (C2-a)

Visitors to The One Nanyuan recognized the "fashionable product design" element more strongly than did their counterparts visiting Gaeavilla Resort. This element is often presented through culture-based creative design. In this study, the two research subjects developed their own products. The participants perceived the fashionable product design by gaining product experiences when attending activities and having meals. One of the participants mentioned:

> "The tour began at 4:30 p.m. and ended around 5:30–6:00 p.m. when we were back. Because it was dark throughout the trip, we were each giv en a lantern. The scene when [everyone] was holding a lantern while walking was stunning; the vibe was great." (C2-e)

Both resorts demonstrated esthetic elements. Esthetics originate from tourists' sensory experiences of external and environmental spatial attractiveness [1,2]. In the esthetic experience element, "architectural style and esthetics" reflected the sensory pleasure resulting from the environmental space inside and outside the thematic CLI businesses. The "fashionable product design" extended the sensory experience from environmental spaces to product design.

4.1.4. Escapist Realm

An escapist experience requires customers to be actively involved and strongly immersed in the surrounding environment, wherein customers are engrossed in a different time or location. The results show that escapism consists of two elements, namely "living design different from routine life" and "uniqueness of service facilities". The element "living design different from routine life" refers to the isolation of the environment, the privacy of the space, and the quiet and relaxed atmosphere. In the context of CLI businesses, the results reveal that one's sense of escapism depends on the location of experiential sites. Most attractions are concentrated within a specific cluster to form a completely different area in which visitors can escape their daily routine. However, CLI businesses with a themed lifestyle are commonly separate from the tourism cluster. In particular, customers' perceptions of escapism were positively correlated with the differentiation between creative life experiences and their usual living spaces. One of the respondents mentioned:

> "Our usual life is in a city with high walls. When we [are] there, we feel different from reality. [...] In daily life, we can't experience such a garden living space" (C2-b)

"Uniqueness of service facilities" refers to facilities being different from people's daily lives, which encourages customers to actively experience and immerse themselves in such environments. For example, in Gaeavilla Resort, while customers gazed at the herb gardens, herbal remedy pools, and herb-related room facilities, they felt relaxed and that they were different from their usual living environment, and they may have immersed themselves by participating in the business offerings. One of the respondents stated:

> "When you walk into this resort, it doesn't look like a regular hotel, but rather like home. The location of the resort is quite hidden, and when you go in, it seems

> to be far away from the hustle and bustle of the city. [...] The hotel's bathtub, swimming pool, and herb-related room facilities [...] can make you completely relax and experience a different living environment than routine life" (C1-a)

Escapism elements were also observed in both resorts. Among them, tourists' escapism perceptions were the highest, indicating that escapism plays a greater role in thematic CLI. The "living design different from routine life" corresponded to experience economy theory [1,2]. The "uniqueness of service facilities" highlighted that CLI businesses must design unique service facilities that correspond to their themes to elicit active participation and immersion in tourists, thereby generating an escapism experience.

4.2. Customer Experience and Brand Loyalty in CLI Businesses

As presented in Table 2, the results reveal that the four realms of experience had a distinct influence on brand loyalty. This study explored the experience elements leading to brand loyalty according to customers' perceptions. The said elements were obtained through a summary based on the data presented in Figure 1. Furthermore, brand loyalty implications, comprising intention to revisit and recommend and brand attachment, were determined. On the basis of the interview records, elements regarding customer experience were assigned to the corresponding brand loyalty dimensions, as presented in Figure 2.

Table 2. Summary of elements of the realms of experience corresponding to brand loyalty.

Realms of Experience		**Dimensions of Brand Loyalty**		
Theme	**Subthemes**	**Revisit Intention**	**Recommendation**	**Attachment**
		Number of Statements (Code of Participants)		
Entertainment	Relaxing and entertaining programs	3 (C1-i, C1-h, C2-g) *		
Education	Living esthetic program relatability	5 (C1-f, C1-g, C1-i) * (C1-j, C2-h) **		
Esthetics	Architectural style and esthetics	7 (C1-a, C1-c, C1-i, C2-c, C2-j) * (C1-e, C2-h) **	3 (C1-c, C2-c) * (C2-h) **	
Escapism	Living design different from routine life	8 (C1-c, C2-b, C2-d, C2-j, C2-f, C2-g) * (C1-e, C2-e) **	4 (C1-c, C2-c) * (C1-e, C2-h) **	4 (C1-f, C1-g, C2-c, C2-d) *

Number of visits: *—Once; **—More than once.

Figure 2 shows a framework of experience realms and brand loyalty in CLI businesses. However, the impacts of the four realms of experience upon brand loyalty are reflected in specific characteristics of experience. In particular, both escapist and esthetic experiences were found to be the most mentioned elements that led to customers' loyalty. Overall, this study is supported by the experience economy theory by Pine and Gilmore [1,2], which describes how each experience influences a customer's brand loyalty.

According to the data analysis, customers' escapist experience had a particularly important influence on brand loyalty. Regarding the realms of escapist experience, the living design being different from routine life had an influence on revisit intention, recommendations, and attachment toward the target destination. The themed CLI businesses offer a unique lifestyle space that will attract customers to experience a different stay again and recommend the brand to their friends and family, as exemplified in the following excerpts:

> "I want to experience different styles of accommodation" (C2-b)

> "Maybe I'm older and I don't like to go to noisy places. The buildings in the park look very comfortable and when there are few people in the park, it is very comfortable to walk around" (C2-f)

> "The yogic pavilion and the scenery of the larch pine in the garden [...] make people feel that the soul is united. Next time, I want to experience this program" (C1-c)

In addition, some respondents were looking forward to experiencing a wedding or participating in a wedding event in the target site, which may enhance customers' attachment to the brand. One of the respondents mentioned:

> "I'm looking forward to experiencing a wedding at the Kengo Kuma's Wind Eaves Pavilion, [which] was beautiful and [special]" (C2-c)

Wedding programs are different from general tourism. In addition to designing differentiated leisure programs to enhance brand loyalty, CLI businesses with a themed lifestyle offer programs with special significance (such as weddings) that would lead to customers' attachment toward a brand.

The results reveal that esthetic experience is another important element influencing customers' loyalty. Regarding the realms of esthetic experience, the subtheme of an architectural style and esthetics has an influence on revisit intention and recommendations. Customers who had special esthetic experiences within the themed CLI business settings during their tours were more likely to be loyal, as exemplified in the following excerpts:

> "When some cultural or festival programs [are] provided by The One Nanyuan, I will be interested in coming here to experience it again". (C2-h)

> "Next time, I hope to experience a concert at the Kengo Kuma's Wind Eaves Pavilion—that will be a great pleasure". (C2-c)

> "Because I like minimalism and the facilities of the resort are beyond my imagination, I just think it's really great and I will recommend it to my friends to stay". (C1-c)

In educational experience, the subtheme of living esthetic program relatability has an influence on revisit intention. When customers found a real learning activity that could increase their knowledge or skill during their visits, thereby stimulating their curiosity to learn, they were more likely to look forward to something new in the future through revisiting. Some participants (N = 5) mentioned that the innovation within the themed experiential program, such as fragrance beauty, vanilla floral art, herb planting, horticultural therapies, cooking classes, relaxing tea sessions, etc., can enrich their knowledge of daily life, which will attract them to experience this brand again.

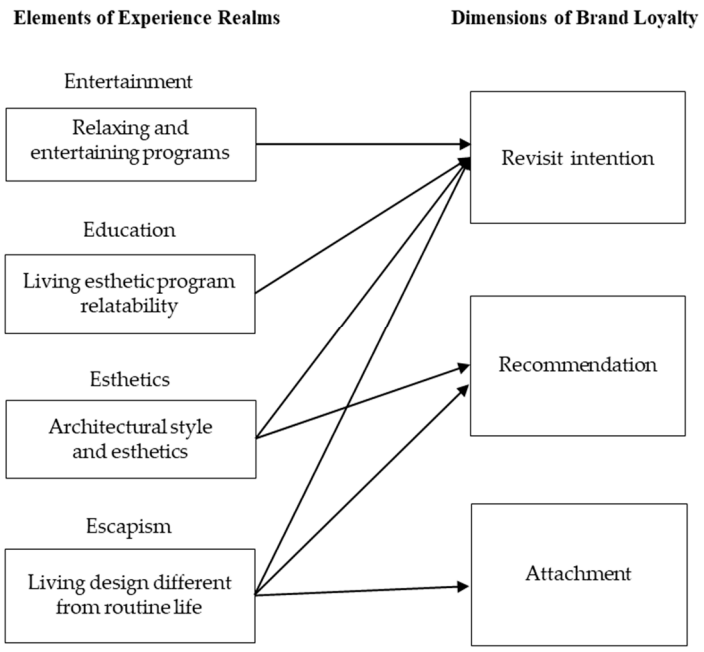

Figure 2. A framework of experience realms and brand loyalty.

The results reveal that the realm of entertainment experience is the least relevant for this study, with few participants (N = 3) sharing entertainment experiences that led to their loyalty toward the visited brand. Respondents mentioned that relaxing and entertaining programs may encourage their revisit intention, such as new special meals, enjoying a concert in the Kengo Kuma's Wind Eaves Pavilion, watching a movie in the garden, etc.

The experience realms and brand loyalty cognition were analyzed using the number of visits. In regard to the subtheme "living design different from routine life" in escapism, the interviewees visiting the resort for the first time expected to experience different styles of spaces or accommodation environments (N = 6), whereas those revisiting the resort expected innovative experiences of life design programs (N = 3). The intention to recommend the resort to others was not affected by the number of visits. A small portion of the female interviewees visiting the resort for the first time (N = 4) expected to experience wedding ceremony life design programs to create a special and unforgettable life experience.

The special architectural style and esthetics attracted the interviewees visiting the resort for the first time and strengthened their revisit intention (N = 5)—to pursue more profound experiences—and their recommendation intention (N = 2). The interviewees revisiting the resort (N = 2) tended to revisit the resort with their friends or loved ones to cocreate esthetic pleasure.

Education and entertainment experiences induced less brand loyalty intention. The results revealed that education and entertainment experiences elicited the interviewees' revisit intentions. A small portion of the interviewees visiting the resort for the first time (N = 3) expected to experience interesting theme-related contents provided by the resort, such as tasting new featured cuisines. A few interviewees visiting the resort for the first time (N = 3) exhibited revisit intention induced through the characteristics of living esthetics learning activities. Two of the interviewees revisiting the resort expected the resort to provide new education experience programs.

5. Discussion

This study aims to examine customers' experiences by means of the experience economy theory by Pine and Gilmore [1,2] and to identify elements of the four realms of experience that have an influence on brand loyalty within the themed CLI businesses. The results provide five primary findings that contribute to a better understanding of how customers experience the themed CLI businesses. The main elements in the realms of experience were presented through the subthemes of the experience. Furthermore, the results of the current study reveal that each realm of experience had a different impact on customers' brand loyalty.

First, escapism is the most important realm of experience in the themed CLI businesses. The findings reveal that escapist experience is the most perceived by the participants, compared with esthetic, educational and entertainment experience. The results show that each of the four realms of experience is reflected to a different degree. This finding is supported by a previous study conducted by Oh et al. [15], which found that the four realms of experience were not of equal importance to tourists' assessments of B&B tourism. This study is partially consistent with other works which suggest that escapist experience is an important element affecting customers' experiences in tourism sectors [3,5,15,17].

This study identified "living design different from routine life" and "uniqueness of service facilities" as important elements which facilitate escapist experiences. According to Pine and Gilmore [1,2,13], tourists may search for a journey in which they are completely immersed in a destination and experience a new self that departs from their routine life. Participants enjoyed distinct lifestyle activities, such as staying in gardens with cypress wood or organic herbs, which embarked from their normal routines of life. Escapist experiences require one to greatly involve themselves and actively participate, compared with other experiences [1,2,15]. The uniqueness of service facilities (e.g., herbal remedy pools, herb maze, hot tea spa, cypress wood garden, Kengo Kuma's Wind Eaves Pavilion)

helps customers to actively participate and immerse themselves in the offerings of the CLI businesses.

Second, the result reveals that esthetic design generates increased escapist experience value. According to Oh et al. [15], esthetic or escapist experiences result when tourists immerse themselves in the business offerings of an environment. This study extends the literature on esthetic or escapist experiences by examining CLI businesses. The results show that the escapist experiences gained in Gaeavilla Resort and The One Nanyuan were correlated with the esthetic characteristics of the site in question. The architectural esthetics and the isolated, private impression created by the surrounding environment attracted customers to actively interact with and immerse themselves in the site in question. When esthetic experience design can prompt visitors to actively, rather than passively, interact with and immerse themselves in the site, the resultant esthetic experiences are extended to the escapist realm. A CLI business should smartly incorporate its brand spirit into the esthetic sensory experiences created for individuals visiting a building or space. Therefore, customers can be emotionally triggered. Moreover, businesses should devise service and experience solutions. For example, customers immersed themselves in the tea tasting experience designed by The One Nanyuan as well as the aromatherapy, spa, and yoga classes (using vanilla essential oil) designed by Gaeavilla Resort, allowing them to enjoy such a lifestyle.

The "fashionable product design" esthetic element extends beyond the esthetic experience mentioned in the literature for its association with the environment and space or particular events. According to the literature, esthetic experiences refer to passive participation and immersion in an event or environment which stimulates a "desire to be there" among people and may derive from natural or artificial stimulation, such as beauty in a viticultural landscape or rural architecture [3,5] or the physical environment of a cruise ship [17]. According to the definition of CLI, product and space are the sources from which customers derive their perceptional esthetics, because product experiences are often inserted into the esthetics of the environment and space. For example, when staying and dining in The One Nanyuan, customers can also use tea sets, tableware, and souvenirs developed by this business, and, when staying and dining in Gaeavilla Resort, they can access vanilla-based foodstuff and daily necessities designed by this business. Accordingly, the designs of products are another source of beauty experienced by customers through events or the environments and spaces provided by CLI businesses, and sensory pleasures derived from product designs are thus meaningful in terms of CLI-related esthetic experiences.

Third, creative design incorporates traditional culture into modern lifestyles to create entertainment experience value. Although the participants did not focus on entertainment experiences when visiting Gaeavilla Resort and The One Nanyuan, the services on site were combined with traditional or local cultures through creative design, whereby customers perceived the entertainment value derived from theme-based life esthetics that enhanced service experience pleasantness. For example, The One Nanyuan created a trip imitating an old East Asian lifestyle. Customers were first offered traditional lanterns with a modern design to take a stroll in its garden before having supper in the restaurant. In addition to appreciating East Asian life esthetics, customers could experience the modernization of traditional culture. In this study the perceived entertainment experience echoed what Pine and Gilmore [1,2] held; that is to say, customers tend to passively gain pleasure from an experience through their senses.

Fourth, incorporating education into esthetics prompts customers to learn. The perceived educational experiences in this study were mostly accompanied by esthetic ones. The research sites feature an abundance of ecosystems (e.g., vanilla plants) and architectural culture, which could be utilized by the two businesses—in addition to the guided tours provided by personnel who are professional, kind and humorous—to prompt their customers to actively learn. Throughout the process, the guides were like actors; hence, CLI businesses should train their employees how to act [13]. This was in line with the study of

Chang [22], who found the guide played a crucial role in the educational experience from enterprise perspectives.

In related literature, Pine and Gilmore [1,2] suggested that integrating education and entertainment to produce edutainment is a common approach. Radder and Han [21] empirically studied museum visitors' experiences, demonstrating that their experiences involved edutainment. The results of this study revealed that educational experiences were produced in relation to esthetic experiences. For instance, immersion in the beauty of natural ecology in a vanilla herb farm or sensing the beauty of traditional architecture met tourists' expectations regarding living esthetics through active learning. This finding differs from those of other studies for its emphasis on the value of the educational experiences offered by CLI businesses, which successfully combine esthetics with education.

Fifth, the elements of escapist and esthetic experiences have more significant effects on brand loyalty. The perceived experience elements accurately reflected the participants' brand loyalty in relation to the CLI business. This study found that each of the four realms of experience had a different effect on brand loyalty. Furthermore, the escapist and esthetic experiences of customers exerted a particularly significant influence on revisit intention. The influence of elements related to escapist and esthetic experiences was also more effective than those of other elements. This finding is partially supported by studies investigating the effects of escapist experience upon revisit intention [4,5]. This study is also consistent with other works suggesting that esthetic experiences are the most influential element affecting customer loyalty in cruise ship experiences [10].

The present qualitative study, through interviews, discovered that escapist experiences exerted greater effects on brand loyalty. In addition to revisit intention, escapism contributed to participants' willingness to recommend as well as their brand attachment. Experience-triggered brand loyalty was inspired by specific elements, such as the "living design different from routine life" of escapist experience and "the architectural style and esthetics" of esthetic experience. These elements could help CLI businesses to design an optimal experience realm that strengthens brand loyalty.

6. Conclusions

This study prioritized the escapist and esthetic realms of experience for customers of CLI businesses dedicated to lifestyle design, followed by the educational and entertainment realms. Elements of the realms of experience exerted different effects on brand loyalty. Overall, this study proposes that CLI business offerings are experienced according to the realm of experience; furthermore, this study demonstrates that different realms of experience affect brand loyalty differently, which is a critical insight for CLI businesses designing customer experiences. Rooted in these findings, there are several implications for CLI researchers and practitioners.

6.1. Implications

Regarding the theoretical implications, first, this study suggested elements of the four experience realms, i.e., entertainment, education, esthetic and escapism, proposed by Pine and Gilmore [1,2] and determined elements of the realms of experience that are vital to the aforementioned CLI businesses. Specifically, customers regarded escapist and esthetic experiences as necessary elements for a CLI business. Moreover, regarding the elements associated with customer experience, the fashionable product design identified in this study extends beyond esthetic experiences mentioned in the literature for its association with specific events or the environment and space. The notion of sensory pleasures obtained by tourists from product designs serves as a reference for future research on the association between product design-related experiences and brand loyalty. Regarding educational experiences, this study revealed that such experiences are formed alongside esthetic experiences and are correlated with tourists' life esthetics; these experiences can be generated through education event programs, the design of which must not be limited to simple knowledge and skill acquisition. These aspects characterize the design of educational

experiences offered by themed creative life businesses. Future studies could examine the characteristics of educational experiences provided by other CLI businesses.

Second, this study empirically proved that in CLI businesses, brand loyalty is mainly affected by elements of the realms of experience that carry marketing connotations. Elements that stimulated brand loyalty in customers were mainly related to escapist and esthetic realms and were loosely related to educational and entertainment experiences. Oh et al. [15] developed an experience measurement scale, thereby consolidating experience economy theory and contributing to the construction of a more rigorous knowledge system for this theory. Through employing a qualitative research method, this study enabled the strengthening of the intellectual basis of a theoretical framework for experience economy and brand loyalty in the context of diversified CLI businesses. The framework serves as a basis for future studies investigating the relationship between customer experience-related elements and brand loyalty in terms of travel experiences at specific destinations, thereby improving the travel experience design of CLIs.

In terms of managerial implications, the present study proposed elements of the realms of experience for CLI businesses that prioritize lifestyle design to identify their strengths and resources. Therefore, through a theme-based experience realm design, CLI businesses can create excellent experiences for customers and strengthen their brand loyalty for sustainable development. Given the critical nature of escapism and esthetics in customers' experiences at the sites of themed CLI businesses, a focus must be placed on the characteristics of such experience through videos or articles on digital media, official websites, and social media. Therefore, before their experiences on-site, tourists can imagine the experiences that await them and psychologically prepare for their immersion and participation in such experiences.

Regarding the four experience realms and brand loyalty, the research results revealed that tourists who had visited a site one or multiple times expected innovative product services, experience activities, and spatial esthetics and expressed their intention to revisit with friends or loved ones. Accordingly, the researcher recommends that Gaeavilla Resort and The One Nanyuan design tourism products and modulated tourism experience packages to enable tourists to co-create values among themselves, specifically those related to escapism and esthetics. A portion of the interviewees who visited the sites for the first time tended to pursue gratification through personal leisure and relaxation as well as through influential personal learning and growth. These preferences correspond to entertainment and education experiences. The resorts are advised to utilize their diverse environmental spaces and design various tourist programs, such as meals combined with a specific entertainment service or themed learning programs, to attract tourists and to satisfy customers' individualized life experience needs.

In terms of policy-related implications, themed CLI businesses generally have more distinctive lifestyle design features. The results of the current study suggest the crucial roles of escapist and esthetic experiences. Authorities must provide guidance for CLI business operators to improve their experience-related technologies in terms of escapist and esthetic experiences according to their business themes, thereby elevating the performance of their experiential management. In terms of esthetic experience, CLI operators excel in environment and space design esthetics. By contrast, this study focused on CLIs' experiential characteristics through elaborating on product design esthetics, and the association between product design and brand loyalty in terms of brand loyalty intention was not demonstrated. According to the results, the experiential value of CLI product design esthetics remains to be observed and improved in practice. Authorities can assist operators in promoting the value of their product design among tourists, thereby encouraging tourists to repurchase and recommend them and triggering their attachment to brand products.

6.2. Limitations and Future Research

The generalizability of our findings is limited by the fact that the two CLI businesses were engaged in a variety of industries. Future studies should involve various CLI

businesses. Moreover, the interview data were collected from 20 respondents and were subjected to descriptive analysis, meaning that the results are limited to this CLI business context. Therefore, future research should quantitatively explore the relationship between elements of the realms of experience and brand loyalty and address both the universality and particularity of the CLI experience.

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K-Pop's Global Success and Its Innovative Production System

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Abstract: The global music market has witnessed the rapid rise of Korean pop music, K-pop, in recent years. While there has been an increased interest of scholars from various disciplines to account for the global success of K-pop, limited attention has been paid to the key players in the industry, music businesses. Based on a historical analysis of Korea's music industry, we contend that the innovative production system of Korea's music businesses has played a significant role in facilitating K-pop's global success. In order to provide theoretical support to the argument, this paper critically reviews the existing literature to present debates on (i) the process of how value is created in distinctive stages in the music industry; (ii) cooperative and competitive interactions between firms within the music industry; and (iii) changes in the music industry's competitive environment.

Keywords: cultural industry; K-pop; Korean music industry; Korean wave

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1. Introduction

Korea's pop music (hereafter, K-pop) has achieved remarkable global success in recent years. The successful expansion of K-pop and its musicians into the global markets is evidenced by their impressive records in the global music charts and the prestigious international music awards they have won. A seven-member boy group, BTS, has been the most successful K-pop band in the global markets thus far. For two consecutive years in 2020 and 2021, BTS was the top selling digital music artist in the US [1]. As of 2022, the group has won a total of 12 Billboard Music Awards, which has meant that the group has won the most Billboard awards [2]. A female K-pop group, BlackPink, has also achieved noteworthy success in the global markets, as it has become the first female group to reach number one in the Billboard Artist 100 chart with its album, *The Album* [3]. Based on the success of K-pop and K-pop musicians, Korea has become one of the fastest growing music markets in the world, rising from the 28th largest music market in 2004 to the 6th in 2020 [4]. The export revenue of K-pop and its music videos rose fivefold between 2017 and 2021, as the total export reached KRW 230 billion in 2021 [5]. With K-pop's global success, there has been growing recognition regarding the significant contribution of Korea's music industry to the nation's economy. K-pop has been described as "South Korea's greatest export" and "the next Samsung" [6,7]. Some commentators have also put BTS in the "same league and Samsung and Hyundai", as the group's estimated contribution to the Korean economy in 2019 was USD 4.6 billion, or 0.3 percent to the nation's GDP [8,9].

The startling success of K-pop has attracted increased attention of scholars in recent years. The small but growing body of research has provided scholarly explanation on the key factors that contribute to this phenomenon. A review of previous studies in cultural and media studies highlights how music, as a cultural product, is created and disseminated. Other studies have examined how the changes in the music industry's competitive environment are driven by technological advancement. While these studies provide some insights, there are limitations in providing a diachronic and holistic explanation of how K-pop has achieved success in the global music markets. In particular, the previous studies

have limitations in explaining K-pop's global success from the industrial perspective and also the pivotal role played by music businesses.

In order to more comprehensively understand the global success of K-pop, this paper focuses on the role of firms within the music industry. Firstly, we critically review the previous studies on the music industry to present theoretical debates for clarifying the complexity of the music industry and the role played by music businesses. We use the theoretical debates to propose an analytical framework that categorises a variety of activities within the music industry into identifiable segments. By applying this framework, this paper diachronically examines the interconnectedness between the key segments and the hegemonic changes in firms within Korea's industry. Specifically, we focus on radical structural changes to the music industry and examine their effect on the relationship and interdependence of firms and their activities in the industry.

Therefore, the primary aim of this paper is to theoretically explain and empirically explore K-pop's global success and the contributing factors. We contend that examining the pivotal role played by Korean music businesses provides a more holistic account of K-pop's global success. Furthermore, this paper enriches the literature on the music industry by providing an analytical framework that may be used to examine the interplay between firms operating in key segments within the music industry.

2. Theoretical Background: Global Expansion of K-Pop and the Global Music Industry

To explain the recent global success of K-pop and Korea's other cultural products, some scholars have focused on the role of the Korean government. Since the late 1990s, the Korean government shifted its approach towards the cultural industry. It moved away from politically controlling the industry and began to actively promote its growth, demonstrating its characteristic as a developmental state [10]. The government recognised the cultural industry, including the music industry, as a vital engine for the nation's economic development and implemented policies for the growth and global expansion of the industry [10,11]. It has been argued that extensive planning and strong support of the Korean government have been crucial in developing the global competitiveness of Korean cultural products, including K-pop [10]. Some scholars have studied the impact of Korea's copyright regulation on the development of Korea's music industry [12]. They argued that the condition for the prevalence of music piracy in Korea that was facilitated by the government's implementation of the copyright regulations had a positive effect on the enhanced competitiveness of K-pop. Other scholars have focused on information communication technology (ICT) infrastructure and digital transformations in the music industry [13–15]. For example, Parc and Kim (2020) [15] highlighted the impact that the all-encompassing digitisation process had on the Korean music industry and how the music businesses across the industry proactively adapted to these changes. Others have argued that the use of ICT has allowed Korea's music businesses to bypass the traditional intermediaries in the global music industry, the major music labels, and directly reach the consumers via online and mobile channels, including social media [16,17]. It represents unprecedented innovative progress in the music industry and has allowed K-pop musicians to establish a dedicated fandom worldwide [18–20].

Some scholars in the cultural and media studies disciplines have attributed the global success of K-pop to the creation of a transnational fandom. There are three main schools of thoughts found in this stream of research. Firstly, K-pop, which is based on the Korean cultural values, was able to penetrate other Asian markets more easily, as Korea and other Asian countries share similar cultural values [14,21,22]. Second, K-pop's success beyond the Asian markets into the Western and the global markets may be explained in terms of cultural hybridity [21,23–26]. That is, K-pop is an outcome of mixed genres and identities of Korean and Western cultural values that have attracted the interest of consumers beyond Asia [25]. Third, scholars have examined the social participatory characteristic of K-pop fandom. Some global K-pop fans not only merely consume music but actively facilitate the expansion of their consumed products in the market, for example, by translating Korean

lyrics into their own languages [27] and creating and sharing dance covers and reaction videos of K-pop music [28,29].

These theoretical debates from different disciplines are useful in exploring the dissemination and consumption of K-pop in global markets, the factors that contribute to K-pop's enhanced global competitiveness and the distinctive characteristics of the global K-pop fandom. However, attention to Korean music firms and the industry has been significantly lacking. In the cultural industry, which is a "system of organisations that produce and distribute cultural good" [30] (p. 665), firms play an indispensable role in the facilitation of commerce, as they produce and disseminate cultural products [30,31]. However, the study of the production and dissemination process of products has largely been limited to the traditional manufacturing and service industries, and has received scant attention in the cultural industry. This warrants more attention to the study of firms and their activities in the cultural industry as the key driver of commercial development of the industry.

Albeit limited in number, there have been studies that have attempted to account for the global success of K-pop by examining Korean music businesses. These studies have focused on the strategies and responses of these firms to the structural changes in the music industry. Using the concept of intermediaries, Shin and Kim (2013) [32] explained that the global expansion of K-pop is not only driven by the growing demand for Korea's cultural products, government support and technological development, but also by Korean music businesses. They argued that it was the strategies of Korean music businesses and competition among them that have allowed K-pop's global expansion [32]. By drawing comparison to Korean conglomerates, Lie (2012) [26] explained the glocalisation strategies of Korean music businesses regarding the entry the global markets. Ubonrat and Shin (2007) [21] highlighted the need for Korean music businesses to find the balance between standardised and localised strategies when expanding into global markets through the formation of partnerships with foreign companies. By explaining the change in the modes of exchange in Korea's music industry, Howard (2014) [33] explained that Korea's music businesses have successfully created a new business model, allowing them to generate diverse revenue streams and leapfrog the major international figures in the global music industry. Oh (2013) [34] highlighted the shortcomings of cultural hybridity and "pop Asianism" [34] (p. 405) in explaining the global success of K-pop. He focused on the process of localising global musical contents by the Korean music businesses and linkages they formed with transnational social media platforms. Using a similar approach adopted by Oh (2013) [34], Park (2013) [14] also emphasised the process of outsourcing music creation to foreign producers, localising musical contents and utilising social media channels for music distribution.

The global success of Korea's music industry is a complex phenomenon, and its unique context in the music industry warrants more in-depth analysis and an approach that is specific to the music industry. Despite attempts of some scholars to explore the role of music businesses in the global success of K-pop, there is a current lack of studies that historically examine Korean music businesses based on an analytical framework developed for the music industry. This may be due to the distinctive and complex nature of cultural industries that involves the production of cultural products that have intangible cultural values, and consumption based on cultural acceptance of those products by the consumers [30,35]. Therefore, we argue that there is a need to historically analyse the activities of Korean music businesses based on a theoretical debate that takes into consideration the distinctive nature of the music industry in order to explain the remarkable global success of K-pop.

The following section provides theoretical debates on (i) the process of how value is created in distinctive stages in the music industry that is different from the conventional manufacturing industry; (ii) cooperative and competitive interactions between firms within the music industry; and (iii) changes in the competitive environment in the music industry.

2.1. Value Creation in the Music Industry

Unlike the conventional manufacturing industry, the music industry has a distinctive set of interconnected value-adding activities that are coalesced to produce final products for consumption. As a cultural product, music is created based on these intrinsic, yet identifiable, values by bringing together creative and commercial inputs from various individuals and organisations, and its marketability is sustained by aesthetic demand of consumers in the targeted groups [36,37]. Diverse activities performed by firms in the music industry, where inputs are changed into the outputs, may be categorised into four key phases, including music product creation, music product development, music product manufacturing and music product distribution.

The first phase is music product creation. Music is foundational to the music industry and is embodied into a market commodity by integrating the creative inputs of music producing, composition and lyrics. It involves gathering creative ideas and collaborative works from creators to materialise consumers' aesthetic demands [38,39]. The second phase is music product development. This phase particularly refers to the casting of singers. A music business is essentially a venturing business that invests in unknown singers who have not been discovered and developed. These singers are mostly ambitious and aspiring singers, and provide raw talents that are processed, packaged and marketed by music businesses [40,41]. The combined efforts of singers and music businesses constitute the third phase of music product manufacturing, which involves music recording and record production, and singer training and management. Music records in the form of music captured in a physical format were the primary commodity in the music industry. With the development of digital technology, the scope of music records expanded to intangible digital music formats, including digital music and music videos [42,43]. Furthermore, the music industry is not only merely dependent on the selling and buying of music in physical or digital formats, but also on the stardom of singers [40,44]. While the physical and digital formats of music records have received much research attention, singers have received little attention in the literature. Thus, in analysing the music industry, this paper takes singers into account as a key music product that is central to the industry. In the final phase, the music product is distributed to consumers. The products are distributed to consumers via several channels. The traditional method of distribution can be described as the physical music records sold through the chain of wholesalers to retailers, then retailers to the consumers [45]. More recently, the development of the internet, combined with digital music compression technologies, has enabled music to be stored in digital formats to be disseminated via information and communication technology platforms [46,47]. Activities of singers also raise revenue through their live performances, endorsement deals, merchandise sales and appearances in television shows and movies [44,46].

2.2. Cooperative and Competitive Interactions between Firms in the Music Industry

The music industry comprises a group of firms that interact and compete to produce music products. Scholars from different disciplines have attempted to explain how these firms in the industry are involved in a wide array of activities. Some scholars focused on how music is created by composers in terms of authenticity, homogeneity and diversity of music genres [38,48–52] and distributed by record companies and digital music distributors in terms of geography, reception of consumers and technological changes [53–56]. Others have analysed various activities, including music production and recording, record manufacturing and distribution, marketing and promotion, publicity and legal representation and distribution of music, which are performed by music producers, record companies, promoters and distributors. Key themes from the management studies literature include value creation and protection [39,57,58], entrepreneurship and innovation [47,59] and market concentration of the industry [46,60].

While there have been many attempts to explore the activities of firms in the music industry, most of the studies have focused on certain segment or segments within the industry [47,61–63]. Firms are situated in different segments in the industry based on

their capacities and competitiveness. They may be highly integrated with other firms in the different segments within the industry, and some firms may compete and cooperate with other firms in the industry at the same time [64,65]. Over time, firms with dominant market power in one segment may also expand the scope of their operations by vertically integrating, while others may outsource their tasks to external companies [39,46,48].

Investigating the interactive dynamics among firms in the music industry over time can provide us with a more holistic understanding of the music industry, as it reveals the shift in market power of firms within the industry. Hence, this paper not only examines the activities of firms in the four segments of the music industry identified above, but also the interconnectedness and evolution of these firms.

2.3. Changes in the Music Industry Environment

Understanding the historical changes in the business environment of the global music industry, especially in terms of cultural globalisation, and the availability of technologies and distribution systems also provides insightful foundation for explaining the growth of the Korean music industry.

The global music industry has displayed cultural globalisation. The traditional perspective on cultural globalisation was based on cultural imperialism, which explained the dominance of cultural products the West that threatened the heterogeneity of the national identities of less dominant countries [66–68]. In the past, the pattern of cultural imperialism was evident in the global music market, as the Western multinational record labels retained strong market positions throughout the 20th century [69,70]. However, cultural imperialism began to lose its empirical validity in recent years, as cultural products from non-traditional powerhouses, such as Korea, have successfully penetrated the global markets, including the countries of traditional dominance [66,71–73].

The historical review of the global music industry also illustrates the significant influence of technological advancement on the transformations of the industry, mirroring the Schumpeterian process of creative destruction. The advancement in music creation, recording and distribution technologies has enabled the creation of divergent genres of music and has changed how the product is packaged and distributed [52,61,74,75]. The pre-digital revolution literature on the music industry was founded upon the physical medium of music records and the related activities, which were largely conducted by the record companies. Music records replaced sheet music as the core product in the music industry in the 20th century and sound recording of music on phonograms became the dominant media for storing music to be played by phonographs. A crucial transition took place in the music industry in the late 1990s and early 2000s, with the establishment of the digital music market. In digital music markets, music was no longer tied to a physical intermediary, but was recorded in digital formats and distributed electronically using internet and mobile platforms, such as Apple Music, Google Music, Spotify and YouTube [53,61,74,76]. The digital revolution has also shifted the focus in the industry towards musicians and led to the establishment of the concept of 360-degree deals in major record labels, recognising the importance of singer management [70].

3. Research Methodology

A historical case study was adopted as the research method to provide a holistic explanation of the phenomenon of K-pop's global success. The case study method is useful for examining past and current events, and allows researchers to present a rich description of the phenomenon and the context in which the events occur [76–78]. In particular, the case study is an appropriate research method, as this paper aims to investigate the activities of firms in the Korean music industry and their interrelationships with the complications of the environmental context over a period of time. That is, the case study method allows researchers to capture the complexity of the phenomenon and explain the historic dynamics in their context [78–82]. Hence, through longitudinal observation, this paper provides a diachronic analysis of (i) the dynamic interplays between the activities of music businesses;

(ii) the industry structure; and (iii) the business environment over three key periods. The three key periods are divided based on the distinctive nature of the industry, namely (i) political control and underdevelopment during the 1960s and 1970s; (ii) democratisation and industrialisation during the 1980s–1990s; and (iii) globalisation and digitalisation in the post-2000s period. This paper uses secondary data sources, supplemented by a close reading of evidence in previous studies of the Korean music industry. Secondary sources included individual companies' reports, government documents, media reports, including newspaper and magazine articles, as well as broadcasting reports. It also included numerous published interviews of key figures in the Korean music industry, including musicians and other industry professionals.

4. Case Study: Korea's Pop Music Industry, 1960s–2010s

4.1. 1960s–1970s: Political Control and Underdevelopment

During the 1960s and 1970s, Korea's music industry was under the strict control of the authoritarian developmentalist government, as the government subordinated musicians and music businesses for political and ideological purposes using its authoritarian power. While Korea's music industry largely suffered from technological backwardness, a rapid increase in television and radio ownership paved the way for mass distribution of music via broadcasting. This coincided with the strong surge of youth culture, which became a catalyst for the emergence of a new generation of musicians who showed strong assimilation to the Western pop music culture [83]. On the back of the rapid growth of youth culture, Korean youth consumers ascended as a key consumer group.

During this period, a relatively small of number record companies competed in the music industry. Up until the early 1980s, around ten record companies dominated the industry and most of these companies faithfully adhered to the government's political objectives [84,85]. These firms played a central role in overseeing the key functions in the industry, including the production and promotion of music records, and finding new musicians and managing their day-to-day activities [86,87].

For music creation and singer management, former bandmasters and instrument players from U.S. military base music clubs, which served the American soldiers stationed in Korea, played a pivotal role. Following the demise of the US military base music clubs in the 1960s, record companies began to hire leading bandmasters and instrument players as their in-house composers [88,89]. These composers introduced the latest Western music trends to the Korean music scene, as they composed songs for Korean singers. In the 1970s, youth singer-songwriters creating folk and rock music began to gain popularity and support from impressionable youth consumers who demanded new styles of music. In terms of lyric wiring, the activities of lyricists were oppressed by the political and ideological control of the authoritarian government. Consequently, most lyricists deliberately avoided writing lyrics on pertinent social or political issues [90,91]. Singer casting was also a core function of the in-house composers of the record companies. To search for new musical talents, the composers often solicited recommendations from trusted sources they had across the music industry [92,93]. In the 1970s, a large number of live music clubs around major university towns in major cities opened to target youths. These live music clubs developed close networks with producers and DJs of music broadcasting programs who aided the successful entry of some of these singers into the mainstream music scene as the gatekeepers [83].

Music recording and record manufacturing remained typical of an underdeveloped manufacturing sector, using primitive and manual technologies due to limited financial and technological resources available. The record companies also lagged behind the European, American and Japanese recording companies that used more advanced technologies [86,94]. Most record companies also did not have their own recording studios, due to the high upfront costs of setting up the studios. Similar to singer casting, it was also common practice for composers of record companies to be directly involved in singer management and promotion.

Music record distribution remained underdeveloped due to the backwardness of the industry infrastructure and limited purchasing power of consumers in Korea. There was a noticeable regional disparity in the distribution of music records caused by rapid migration of the population from rural areas to urban cities and different rates of industrialisation across the country [95,96]. However, radio and television broadcasting quickly emerged as important channels for music distribution. With a rapid rise in the ownership of radios and televisions, music broadcasting programs became a crucial channel of disseminating key commodities in the music industry, including singers and their music, to mass audiences.

4.2. 1980s–1990s: Democratisation and Industrialisation

The Korean music industry entered a period of crucial transition in the 1980s. Abolition of many politically motivated restrictions significantly improved the conditions for creative and commercial activities for musicians and music businesses. The Korean consumers became more avid consumers of cultural products, including music, as the Korean society enjoyed greater affluence. In particular, youth consumers who demonstrated a heavy reliance on music television programs and an inclination to idolise visually attractive singers solidified their position as the most lucrative group for music consumption.

During this period, competitive dynamics among firms within the industry began to change significantly. Musician management companies (MMCs), which specialised in singer management, rose to prominence by demonstrating their superior abilities to flexibly respond to the protean tastes of media-savvy youth consumers. Led by SM Entertainment, MMCs developed a star-making system (SMS) strategy that was aimed at developing television-friendly youth singers, emphasising their visual appearance, on-stage performance and admirable characters for promotion via broadcasting channels. On the other hand, the record companies gradually lost their dominance in the industry, as they handed their key creative and product development functions to MMCs [97]. In the early and mid-1990s, major multinational record companies and Korean chaebols (referring to family-owned conglomerates in Korea), including Samsung, LG, Hyundai, Daewoo and Lotte, entered the music industry [98,99]. Based on their financial capacity, the chaebols pursued aggressive diversification strategies and invested in the key activities of the music industry. However, they failed to apprehend the unique characteristics of the Korean music industry, which was primarily teenage-centred and built on informal personal networks, and eventually exited the industry.

Music creation under MMC's SMS strategy gave rise to performance-oriented dance music, optimised for promotion via music broadcasting programs. Music composition became more intimately associated with singers' stage performances and visual presentations to highlight their performance skills and manufactured images. Similarly, lyrics were largely treated as a tool to reinforce singers' images, rather than conveying sophisticated messages or making a metaphoric impact [100].

In discovering new musicians, MMCs gained a significant foothold. As MMCs grew and expanded their operations, the activities of singer castings by these firms became more specialised and formalised. For example, SM Entertainment held the nationwide auditions, as well as putting out an 'open call' for aspiring singers to send audition tapes [101]. The casting managers judged the performances of aspiring musicians in categories of singing and dancing, and offered the prospective singers to join the company for formal training [101].

In music record manufacturing, record companies upgraded their facilities with automated mass manufacturing systems in response to a shift in the dominant format of music records from LP music records and music cassette tapes to CDs. Increased investment by the record companies significantly improved their manufacturing capacity. With the development of cable music broadcasting programs, music videos were recognised as a crucial promotion tool. MMCs significantly increased their investments to produce high quality music videos for television viewership and production of dramatised blockbuster-style

music videos. It was reported that the average cost of music video production throughout the 1990s increased more than tenfold [102].

MMCs also introduced a more specialised approach in developing star musicians under its SMS strategy. Instead of granting recruits an immediate chance to record and release music albums, MMCs required them to undertake in-house training programs. The programs not only included music and performance skills, but also diverse entertainer skills to enhance their competitiveness as an entertainer on various genres of TV programs. Development of a more refined SMS strategy is also reflected in the changes in the organisational structure of MMCs. For example, SM Entertainment separated the function of managing visual presentations and performances of singers from the artist and repertoire (A & R) team by establishing the standalone visual directing team [101]. The company assigned specialised managers, including fashion coordinators, visual director and image makers, to be responsible for tasks related to singers' fashion, accessories, hair styles and makeup [101].

The operations of music record wholesalers and retailers expanded as the music records sales market grew considerably. Some wholesalers vertically integrated to establish their own retail shops through which they could maintain greater control over the music record distribution [103,104]. Moreover, there was a major structural change in the Korean broadcasting sector. In addition to the existing 3 terrestrial stations, 21 new cable broadcasting channels began their operations in 1995. In particular, the opening of two specialised cable music broadcasting stations, MNet and KMTV, meant significantly increased music broadcasting programs for the viewership [105,106]. In response to the formation of the dominant viewer group by adolescent audiences for music broadcasting programs, most music broadcasting programs primarily focused on targeting these young viewers.

4.3. Post-2000s: Globalisation and Digitalisation

At the start of the 2000s, the Korean government recognised the significance of the cultural industry, including the music industry, in generating return for its new economic development program, which was based on knowledge-and technology-intensive industries. Thus, the government provided more constructive support for the music industry. In particular, the government promoted the integrated growth of the music industry with the nation's highly advanced information and communication technologies (ICT) [10]. In addition to this, the introduction of more advanced technologies, enabling the convergence of online and mobile media platforms, created highly favourable conditions for the expansion of the digital music market. The active support of the government, combined with the consolidation of a highly networked society, accelerated the digital transformation of Korea's music industry.

MMCs with abilities to develop competitive market-oriented music products based on the SMS wielded greater power by diversifying and internationalising their operations. For example, MMCs diversified into music record retailing, which further strengthened their market positions. In the early 2000s, eight music businesses, which included MMCs specialising in the development of teenage idol singers, SM Entertainment and DSP Media, established a joint music record distribution firm, IKPOP [107]. As the earnings from music record sales rapidly declined due to the growth of the digital music market, MMCs expanded their operations outside the traditional boundary of the music industry and also paid more attention to the global markets. Major MMCs utilised their internalised singer development strategies to develop singers as multi-talented entertainers to be deployed across multiple cultural sectors. MMCs also more actively sought to expand into global markets. During this period, major telecommunication companies, which gained significant market shares in music distribution channels, began to vertically diversify by acquiring music record companies. For example, major telecommunication companies, SK Telecom and KT, acquired Seoul Records and Doremi Records, respectively, in the mid-2000s [108]. These firms played a pivotal role in the digital transition of Korea's domestic music market.

With aggressive horizontal and vertical integration strategies, MMCs and the conglomerates dominated the music industry.

Music creation for most K-pop musicians followed a typical strategy of integrating well-crafted powerful performances into the mix of electronic dance and hip-hop music genres, with catchy melodies and easy-to-sing-along simple lyrics. In particular, MMCs recognised that performance-oriented dance music using such formulaic strategies had a better chance of being accepted by foreign consumers [109,110]. To make the music more appealing to foreign consumers and to achieve greater diversity in musical styles, MMCs increased collaborations with foreign composers. In the early 2000s, the government subsidised Korean MMCs to attend major international music exhibitions and tradeshows, including MIDEM (Marché International du Disque et de l'Edition Musicale), to purchase licenses of music composed by foreign composers. Throughout the 2000s, it became a common practice for Korean MMCs to engage with foreign music producers and composers, as well as multinational music publishing companies, to obtain licenses of music created by foreign composers [111,112].

As the demand for Korean music and musicians from global markets soared, a growing number of MMCs pursued a globalised approach in recruiting singers of non-Korean nationalities and ethnicities. For example, to search for Chinese members for its idol groups, SM Entertainment established the Chinese subsidiary, SM Entertainment China, in 2006 and it held regular auditions in major Chinese cities [113,114]. Since the late 2000s, SM Entertainment has expanded the coverage of foreign auditioning and conducted regular auditions in more than 15 foreign countries [115].

MMCs developed a more refined singer training system aimed at helping their singers to more effectively penetrate the global markets. For example, foreign language lessons and cross-cultural training became essential in singer training to facilitate singers' global reach [116]. Korean MMCs also actively used social media and video sharing platforms for the promotion and distribution of their musicians in the global markets. For example, BTS has used social media extensively to interact with its dedicated fans, widely known as ARMY, around the globe. BTS' strong presence on and engagement via social media are evident by their Guinness World Records for having the most followers on Instagram for a music group; as of February 2022, the group reached more than 60 million followers on Instagram [117]. The use of social media allowed MMCs to monitor the opinions of domestic and international consumers effectively, allowing them to adjust their strategies in the production of subsequent albums [118,119]. In order to reach global markets, Korean MMCs paid greater attention to producing higher quality music videos to be distributed via online video sharing services. Production of quality music videos, coupled with online video sharing services permitted, Korean MMCs to effectively promote their musicians and music to global audiences, bypassing the intermediaries in the traditional physical music record distribution channels. In that process, instead of claiming copyright of the videos to prevent the reproduction of the videos by the internet users, Korean MMCs opted for an open-source approach to allow internet users to share and modify their original videos freely [120].

The progression of the ICT infrastructure significantly reconfigured the online media music product distribution market in the 2000s. One of the key technological developments in the music industry was the introduction of smartphones, which integrated the functions of computing capability with mobile phones [120]. This presented the interface between the previously dichotomised digital music product markets for the online and mobile music markets. With the advent of smartphones, consumers could directly download digital music products and access online media using the internet connection from smartphones, without using the mobile networks, and play the downloaded files or access online media music contents on the smartphones [121].

As discussed, Korea's music industry has developed to become one of leading music industries in the world and its success may be attributed to a number of factors. Firstly, Korea's music industry benefitted from the favourable conditions created in the local and

global music markets. There was a crucial shift in the Korean government's paradigm for governing the music industry, as its approach changed from political control to industrial support. Accordingly, the Korean government introduced effective initiatives and support programs to promote the commercial growth and global expansion of Korea's pop music. Korea's domestic industries, which provided crucial infrastructure and support for the music industry, such as the electronics and ICT sectors, have also demonstrated strong growth in recent decades. Development of these industries laid the foundation for the rapid industrialisation and digitalisation of Korea's music industry. The trend of cultural globalisation, coupled with the advancement in internet communication and digital media technologies, also boosted the demand for Korea's pop music in the global markets.

Secondly, Korean MMCs have demonstrated competency in developing globally competitive music products based on their product development strategy. The MMCs developed the core platform for developing star musicians, a strategy we referred to as SMS. Using this common platform, MMCs were able to produce market-oriented music products by flexibly responding to the demands in the global markets. This significantly reduced the costs and risks of product development and also enhanced the chances of their successful penetration into the global markets.

Thirdly, Korean MMCs capitalised on the development of the ICT infrastructure for effective promotion and distribution of their products in the global markets. The digital transition in the music industry since the 2000s has allowed music businesses to directly link with consumers. This meant that Korean MMCs were much less constrained by the entry barriers created by the major multinational music record labels in the traditional music record distribution system. Korean MMCs were able to effectively reach the global consumers using the online media and social media channels.

5. Discussions: Understanding Global Success of K-Pop

5.1. Structural Changes in the Global Music Industry

The music industry of each nation is inevitably connected to the global music industry. How the global music industry develops over time impacts each nation, and Korea's music industry was no exception. As a latecomer, Korea was in the periphery of the global music market, but it has rapidly caught up with the leading music industries in the post-2000s period.

Korean music businesses gained competitiveness in the global markets, as they promptly and effectively responded to the radical digital revolution and cultural globalisation that took place in the global music market in the post-2000s period. The global music market was radically restructured and it created a gap for new types of music businesses to emerge. One important gap created due to the digital revolution was the opportunity for musicians and music businesses to more directly link and engage with global consumers, without having to rely on the traditional distribution channel dominated by the major multinational record labels. By utilising the internet and mobile infrastructure and implementing refined social media strategies, Korean music businesses have capitalised on the rapid digitalisation of the music industry to expand rapidly into the global markets. This, combined with the support of the Korean government and the world-class ICT infrastructure in Korea, empowered the Korean music businesses to gain and sustain competitive advantages both in the domestic and international markets.

Furthermore, the global music industry exhibited cultural globalisation, as diverse music genres performed by singers outside the Anglo-American music markets spread across the globe. This allowed music products from a nation with sufficient universal appeal to reach the global markets, as the cultural globalisation process secured a greater level of acceptance from global consumers. As discussed above, the Korea music businesses accumulated competency to develop music products that could satisfy the diverse and rapidly changing tastes of global consumers. There was a strong emphasis on visual presentation in the domestic market as colourful costumes, synchronised dance moves and catchy tunes became the key formular for developing successful idol musicians in the

1990s. Since then, the Korean MMCs have further developed product making strategies and capabilities that have allowed K-pop and its singers to gain and sustain competitiveness in the global music product markets. These major changes in the music industry also impacted the firms' activities and their hegemonic positions within the industry.

5.2. Players in the Music Industry

As illustrated in the case of Korea's music industry, a constellation of firms perform various activities within the music industry. The unique nature of the music industry in terms of production, distribution, consumption and sources of competitiveness, compared to conventional manufacturing or services industries, makes understanding the process of value creation more convoluted. This paper has attempted to clarify the complexity in the music industry by proposing an analytical framework. It categorises a variety of activities in the industry into identifiable key segments—music product music product creation, music product development, music product manufacturing and music product distribution—which may facilitate a more systematic analysis of the industry.

In this paper, we have also attempted to address the limitations in the existing literature on the music industry by examining the role of firms in developing competitive singers. We have highlighted singers as a key commodity in the music industry, and integrated singer casting, training and management into our analysis. While the music industries in the West have largely observed firms cooperate with self-made star singers, the case of the Korean music industry demonstrates firms that carefully planned and equipped singers with necessary skills and qualities to develop them as star musicians with global competitiveness. For this, Korean MMCs adopted SMS, a specialised strategy of developing star musicians. As demonstrated, SMS is indispensable in understanding the rise of Korea's pop music industry.

5.3. Interconnectedness between Key Segments and Firms in the Music Industry

In the paper, we discussed how firms in the industry interact with one another to produce and deliver the products to consumers. As illustrated, a variety of firms operate in one of more of the four key segments based on their ownership of resources, capabilities and competitiveness. The size and scope of activities of firms may vary; firms may be small-and medium sized firms or individuals operating as a one-man company, possessing expertise in one of the segments, or larger-sized firms that internalised a number of activities across multiple segments.

We contend that understanding the interconnectedness between the key segments and the hegemonic changes in firms can provide greater insights into the development of a music industry. The case of Korea's music industry showed the dynamic interactions between firms operating in those segments, and how these interactions evolve over time. It was observed that firms that gained dominant market power in one of the segments vertically integrate into another segment over time. For example, after developing competency in casting and managing new aspiring youth singers, MMCs internalised music creation within their operations and also expanded their operation to distribute music products. Similarly, large telecommunication companies and major cable music channel operators vertically integrated to produce albums and develop new singers.

5.4. Structural Changes in the Music Industry and Their Impact on Key Segments and Hegemony

From a diachronic perspective, the structural changes in the music industry can significantly impact the competitiveness and hegemonic positions of firms in the music industry. This paper identified key factors that have contributed to the crucial structural changes in the music industry and analysed how these changes have impacted the balance of power held by firms in different segments of the industry over a period of time.

This paper demonstrated that when the music industry undergoes fundamental structural changes, the interactions among the key segments, as well as the hegemonic positions of firms within the industry, may be altered significantly. For instance, the music industry,

since the early 2000s, has undergone crucial changes in terms of digital music compression and storage technologies, and electronic distribution of music products. The advent of digital music has reshaped the Korean music industry, as physical music record manufacturing and distribution quickly shrunk, while digital music distribution expanded. In the midst of the digital transformation, traditional record companies gradually lost their dominance. On the other hand, MMCs and major telecommunication companies rose to prominence in the industry. In particular, MMCs have become the dominant type of firms in the industry based on their strategy of developing singers. MMCs disseminated these singers in multiple cultural sectors and to the global music markets to compensate for a decline in music record sale revenue in the domestic market. This illustrates how the structural changes in the music industry alter the relative significance of key segments and the competitive dynamics among the firms in the industry. As observed in the Korean music industry's case, when an industry is going through a turbulent change, a generation of firms may quickly rise to take a dominant position by rapidly and flexibly responding to the changing business environment.

This article contributes to the body of knowledge in explaining the music industry's development through the analysis of relationships between firms in key segments within the industry. Prior studies have focused on a linear process of products being developed, produced and distributed by music businesses. Our article extends this theoretical approach to analyse the cooperative and competitive interactions among the firms across the music industry through longitudinal analysis. Some firms may develop innovative systems to dominate the segment in which they operate in, and subsequently venture into other segments over time, while other firms may gradually lose their competitive position in the segment. Accordingly, we propose a diachronic industrial perspective that analyses the interaction among firms in the key segments in the music industry to investigate the impact of innovative production systems on the development of the industry.

Our study also contributes to empirical research on the global success of Korea's pop music industry. The rise of K-pop in global markets has attracted scholarly attention to examine the various factors that contribute to its success. Although the effects of government support, advancement in digital technology and cultural globalisation have been extensively studied, relatively little attention has been paid to the evolutionary changes in the strategies of Korean music businesses. Our study addresses this research gap by highlighting the role of innovative production systems developed and implemented by Korean music businesses in the global success of K-pop. It provides valuable insights into the innovative strategies of Korean firms, which enhance our understanding of the phenomenon of K-pop's global success.

6. Conclusions and Further Research

This paper sought to explain the development of Korea's pop music industry by analysing the changes in firms' activities over time. This paper adds to the knowledge base of the literature by introducing a framework for analysing the activities of firms in the music industry and redressing the limitation of scant attention given to the role of music businesses in the global success of K-pop. To provide more comprehensive understanding about the various activities and hegemonic changes in the firms, the paper placed the focus of attention on the interconnectedness and interdependence between firms in the key segments of the industry over time. It particularly used a diachronic approach, rather than focusing on a single firm and single or few activities from a static perspective.

Korean music businesses were latecomers in the traditional music records market, with limited access to the global distribution channel. However, Korean music businesses were able to penetrate the reconfigured global market as one of pioneers when the market was in the state of unrest and turbulence, due to a radical digital transformation. As the global music market underwent a radical structural transition, the Korean MMCs demonstrated their superior ability to flexibly respond to these changes. More specifically, they leveraged their accumulated strengths in the visual presentation of music, as the advancement in

digital music technologies allowed MMCs to more directly engage with foreign music fans via multimedia online and mobile channels.

Based on the findings of the paper, it can be concluded that theoretical understanding in the following three areas may be useful to better account for the activities of firms in the music industry that have undergone a complex transformation. First, it is imperative that we analyse the unique value-adding activities within the music industry, and how these are combined together to create the final product before reaching the consumers. Second, this study suggests that understanding how different firms in each segment within the music industry interact with one another over time provides insights on the growth and development of the industry. Third, we need to examine the factors that bring about structural changes in the music industry and how these factors may reshape the interaction between the key segments in the industry and hegemonic positions of the firms.

Finally, there are some limitations and shortcomings that leave room for further studies. First, the study was confined to the case of Korea's music industry, which limits the generalizability of the results. Expanding a holistic macro level analysis of the music industry beyond that of Korea would provide more substantive debates, as considerable discrepancies may exist in product creation, development, manufacturing and distribution in other music industries. Furthermore, the analytical framework from this study may be replicated in other cultural industries, especially those that rely on the stardom of entertainers. It could be a meaningful step in furthering our knowledge of how the changes in business activities, and relationships between firms and key segments over time influence the development of the sector. Second, this paper was based on a specific local market, Korea's music industry, and the process of how this industry has penetrated the global markets. While it focused on an industry that has already achieved global penetration, this will inevitably have limitations in explaining other music industries that have not yet been able to enter the global market. Third, this paper has examined the music industry from a broad industry level. There is a need for the invigoration of research on the music industry at the firm level to examine the actions of individual firms. Moreover, the study of the music industry is fundamentally different from the traditional manufacturing and service industries. That is, the cultural products, such as music, are not consumed based on utilitarian functions, but based on aesthetic or sensory functions and cultural values within the idiosyncratic boundary. Therefore, the research of the music industry needs to be expanded to consider cultural values of music and their acceptance by consumers.

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The Relationship between Form and Ritual in Cultural Sustainability

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Abstract: Intangible cultural heritage tourism has become a hot topic in academia and industry. As a vital tourism resource, intangible cultural heritage can activate the in-depth experience of tourists for local culture to enhance the attraction and competitive advantage of national or regional tourism. From the perspective of culture, design is used to realize a kind of life taste and form a lifestyle through cultural creativity and industry, with applications in different fields to create a human lifestyle through innovative design. This study proposed a framework exploring form and ritual and discusses the aesthetic economy from form (Hi-tech) to ritual (Hi-touch) through case studies. There were three cases that analyzed how to improve local tourism development through the interaction between form and ritual. The results show that this model can integrate sustainable development into intangible cultural heritage tourism and can be further verified in other countries and regions.

Keywords: cultural innovation; sustainable development; form; ritual

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1. Introduction

Since the 1990s, the study of livelihood in rural areas has become an essential issue in alleviating rural poverty [1]. The sustainable development of indigenous livelihoods requires affirmation and protection of the wisdom of local cultures [2]. Intangible cultural heritage is the essence of local folk culture and an important part of cultural heritage. In 2003, the UNESCO General Conference adopted the "Convention for the Protection of Intangible Cultural Heritage", which aims to protect the intangible cultural heritage of various countries, including the research, preservation, protection, publicity, promotion, inheritance, and revitalization of heritage in all aspects. The relevance of intangible cultural heritage and sustainable development has been widely recognized and advocated by major international organizations (e.g., ICOMOS 2011; UNESCO 2013, 2015; UN-HABITAT 2016) [3]. Travel has already become an inseparable part of human lives, even in times of global world problems. However, serious problems such as excessive energy consumption and increasingly severe negative environmental impacts, including climate change, need to be solved urgently [4]. Many scholars are exploring how to realize tourism's cultural and social values except for economic benefits. Research on intangible cultural heritage tourism has become an academic hotspot, especially the impact of intangible cultural heritage tourism. As a valuable tourism resource, intangible cultural heritage provides the possibility for the development of the corresponding tourism industry. Under the upsurge of public concern, intangible cultural heritage, as an important tourism resource to enhance the attraction and competitiveness of national or regional tourism, is increasingly recognized. The potential demand of tourists for an intangible cultural heritage tourism experience is enormous, and a large number of tourist groups may become consumers of intangible cultural heritage tourism [5]. Culture and its heritage reflect and shape

values, beliefs, and aspirations, thereby defining a people's national identity. It is crucial to preserve our cultural heritage because it keeps our integrity as a people. In addition to its intrinsic value, culture provides important social and economic benefits. With improved learning and health, increased tolerance, and opportunities to come together with others, culture enhances our quality of life and increases overall well-being for both individuals and communities. In addition, culture is a driver of sustainable development. Therefore, culture must be integrated into sustainable development strategies.

According to data from the National Bureau of Statistics of China, in 2019, the number of domestic tourists in China reached 6.006 billion, the number of outbound tourists was nearly 150 million, and the number of inbound tourists exceeded 60 million, making China the world's largest tourism country and the country with the highest number of domestic and foreign tourists. However, because of COVID-19, the number of domestic tourists in China was 2.879 billion in 2020 and 3.246 billion in 2021, with a total decrease of 52.1% and 46%, respectively, compared with 2019 (NBSPRC, 2022). Reactivating the development of tourism through cultural innovation has become an urgent research topic. The value of cultural innovation has changed from the pursuit of Hi-tech quality of form in the past to the Hi-touch taste of ritual, forming an aesthetic economy from Hi-tech to Hi-touch to add value to tourism in ethnic minority areas and help local people eliminate poverty and become rich.

Minority areas retain a large number of intangible cultural resources, which is the cultural wealth accumulated by locals over a long period of time. However, today, with society's rapid development, they are facing the dilemma of losing vitality. How to better inherit and continue these unique cultures and achieve sustainable development is an important research topic. The custom of eating together has always been one of the enduring research topics in anthropology and ethnology [6], through a study of communal meals at religious and sacrificial ceremonies, and states that "those who eat and drink together are closely linked by a bond of friendship and mutual responsibility". The form of eating together has the cultural function of constructing "we belong to the same community" among people. In Chinese culture, as a symbol of social status, etiquette status, special occasions, and other social affairs, food is not only a nutritional resource but also a means of communication. The "Zhuanzhuanjiu" (Turning wine) of the Dong and Yi ethnic groups, the "Tongxinjiu" (Concentric wine) of the Lisu and Dulong ethnic groups, and the "Lianbei" (Continuous cup) of drinking of the Paiwan ethnic groups in Taiwan all use the method of drinking together to share delicious wine. Being a beverage made by brewing, wine is actually a cultural extension of human food and has two layers of "cultural" and "super-cultural" properties. With the concept of sustainable development of intangible cultural heritage tourism, foreign tourists can enhance their in-depth experience of local culture in the ceremonies of different activities, strengthen the communication effect of culture, and at the same time enable local people to better recognize the value of local culture. This ensures that cultural memory can be passed on from generation to generation and makes rational use of traditional culture to form a benign interaction and achieve sustainable development.

2. Literature Review

2.1. Sustainable Development of Cultural Heritage Tourism

Cultural heritage is an important factor for the sustainable development of tourism, which can improve public awareness and support for cultural relics protection, and also make a great contribution to poverty alleviation and the protection of nature and culture [7]. Jokela et al. [8] discussed how art and design practices might help support and develop renewable economies in the Arctic. The dimensions of sustainability in this context include cultural and social sustainability, which means that contemporary renewable productions must respect cultural diversity and heritage and be produced in collaboration with local inhabitants to share economic benefits with the region. Practical ideas and potential

strategies for developing the use of arts-based methods in creative tourism were presented by Huhmarniemi et al. [9].

Developing countries are rich in intangible cultural heritage, and the development of tourism by villagers can reinforce the importance of their traditional culture, bring them a sense of pride and identity, and create (rebuild) their new identities through tourism [10,11]. It also enhances the sense of experience and promote sustainable development. Through festival tourism products, ethnic villages create an in-depth experience to improve cultural taste, excavate ethnic culture, cultivate festival brands, carry out experiential tourism, develop unique tourism products, enhance the participation of tourism projects, and create an authenticity theme experience. Sacred values reflect the authentic character of local culture [12]. Sincere encounters enable tourists to participate in genuine cultural exchanges or interactive experiences [13].

Cultural commercialization can be regarded as a means for people to reevaluate their history [10]. The combination of tourism poverty alleviation and intangible cultural heritage tourism in ethnic areas can improve the quality of life of poor people and establish cultural and ecological protection areas. Community participation in intangible cultural heritage tourism development is conducive to protecting and cultivating the living space of intangible cultural heritage, inspiring and highlighting the cultural consciousness of the inheritance subject, and exploring and displaying the spiritual connotation of intangible cultural heritage. Tourist artworks that absorb ancient culture are not only a response to consumer demand, but also a response to nationalism.

The authenticity of intangible heritage is rooted in the location of the heritage, and they expect a local performance. At the same time, there is still a primitive spiritual connection between off-domain existential intangible heritage tourism and the heritage identity. Studies have shown that when events take place far away from the source of cultural traditions, tourists can also obtain a high degree of authenticity perception, and there are significant group differences [14]. Chronis [15] believes that tourists are not passive text readers during story performances but actively participate in negotiation and fill in gaps and imagination by using their previous background knowledge. In the interactive performance, with the jointly constructed text circles in the live culture, read by its members and further changed through constant reinterpretation and changing social context, a co-construction culture model is constructed, illustrating that the living inheritance of intangible cultural heritage in the tourism field is precious.

2.2. Cultural Innovation Design

Creative cultural design has two purposes: to preserve people's memory of history and skill of life; that is, intangible cultural assets and tangible cultural assets. As far as historical memory is concerned, it must pass through real hardware (building or field) to store people's memories. From the perspective of creative design, people should not only keep the tangible field, but the main purpose should be making this field a perceptual field (situation), in order to evoke people's historical memory. This, according to this memory, then provides people with a touching experience to stimulate people's life, and then connects the surrounding fields to build a sensory life circle, so as to encourage people to create a creative life with cultural connotation. The regional knowledge system is formed in situated learning in relation to local ecocultures, traditions, and diverse indigenous and non-indigenous cultures. The knowledge can be adopted by newcomers and even guests when participating in ecocultures [16]. Therefore, the purpose of cultural innovation design is to "create a perceptual field (form), provide a moving experience (ritual) and construct a sensory life (situation)" through creativity. As far as life skills are concerned, the purpose is to stimulate creativity with intangible assets, and then reproduce the creativity from cultural meaning in modern life using modern technology. Intangible cultural assets can only show their skills through tangible daily necessities.

In the face of the rapid development of information technology, designers should act as "interpreters of technology, leaders of human nature, creators of sensibility and

makers of taste". Among them, the makers of taste are Hi-touch which moves consumption. Hi-touch cultural and creative products express human nature, while Hi-tech industrial products pursue material nature. Cultural and creative products are Hi-touch and appeal to sensibility; industrial products are Hi-tech and appeal to rationality. Cultural and creative products focus on the story of life, while industrial products pursue the rationality of production. Therefore, cultural and creative products usually have a moving story, which can enrich the connotation of life. Through cultural creativity, they can express the quality of Hi-tech and appeal to the taste of Hi-touch. From the perspective of cultural creativity, the aesthetic economy is the best interpretation from Hi-tech to Hi-touch [17]. Cultural innovation design should protect people's most meaningful life memory and most exquisite life skills, and consider how to integrate with the cultural and creative industry to form the cultural relics preservation of upstream memory and skills and stimulate designers' creative design. It is also to let the creativity originate from cultural relics, form the creativity with cultural connotation into products, and then use innovative products for life, and finally let enterprises become brands, so as to achieve the so-called purpose of "originating from cultural relics, forming in products, being used for life, and becoming a brand". From the perspective of the cultural and creative industry, "thinking of the ancients and originating from cultural relics" is the purpose of cultural relics' preservation to achieve the cultural and creative industry of "making good use of science and technology and reproducing elegance" [18,19]. After preserving cultural relics, how to play the follow-up "creating a perceptual field, providing a moving experience, and constructing a sensory life" should comprehensively consider the form and ritual of cultural innovation design.

2.3. Memory and Innovative Design

Memory is a narrative of the past and time, and memory can travel back and forth between the past and reality with the help of imagination [20]. Memory is attached to specific things such as space, pictures, and objects [21]. Events and objects cannot be remembered by themselves, but as special ideograms; they can create an atmosphere of memory and act as a catalyst to stimulate memory. Cultural memory is the collective memory of a nation or country. In communication, cultural memory relies on organized and public collective communication. Ritual coherence (rituelle Kohärenz) is an important way of inheritance [22]. Ritual has two meanings: one is rituals and customs in the sense of religion; the other is the etiquette, customs, and procedures in life. As a medium and form of cultural memory, ritual refers to particular celebration ceremonies at special times and occasions [23].

As a group, our identity will be affected by socially distributed memory processes and individual internal memory processes. Group identity will dynamically affect extended social memory, which affects collective memory as the background of collective identity [24]. The mimicry memory (das mimetische Gedächtnis) is concerned with human behavior (Handeln), while daily actions (Alltagshandeln) and customary customs (Brauch und Sitte) are based on the tradition of mimeticity [22]. The creator creates cultural relics through life skills, which reflects the beauty of craftsmanship and carries the ancestors' wisdom. It is an imitation of life memories, focusing on coping. We always recall, imagine, and realistically reshape the past, so representation is the core issue of memory, and reproduction of memory is an important innovative way. Through cultural creativity, excellent cultural customs and relics are processed and integrated to highlight specific characteristics so that they not only meet the aesthetic and functional needs of modern people, but also have the imprint of unique local culture, which can extend memory. Extended memory largely depends on the interaction or coupling of an individual's rich, dense, and external (currently mainly social) resources [25]. Social interaction can have a positive impact on extended memory [25–27]. In innovative design, creative design is used to create a new aesthetic model, shape a new lifestyle, and create memories that are different or even opposite to previous life experiences, while subverting memories can enhance the audience's experience and realize brand entrepreneurship.

Imitating memory, reproducing memory, extending memory, and subverting memory are the four translation techniques designers use for cultural relics and customs. For imitating memory, the critical point is copying; tor reproducing memory, it is to replace; for extending memory it is to strengthen; and for subverting memory, it is to innovate. In cultural innovation, it can be imitated memory that is completely copied, reproduced memory that strengthens cultural attributes, or extended memory that expands and sublimates, or the completely opposite subversive memory. Collective memory is a continuous trend of thought and a kind of non-human continuity, because it only retains what is active and can survive in the collective ritual from the past. Studies have shown that vision has beneficial effects on individual memory [28–30]. Loveday and Conway [31] demonstrated that images are more effective at evoking memories than written records of personal experiences. Individuals can play an active role in the constructive environment, thus supporting the realization of many memory goals [24]. Long-standing social connections provide a solid connection to the distant past and help form a highly lasting memory through common memories [26]. In cultural innovation design, using the above four kinds of memory can enhance the audience's perception of culture to obtain a pleasant interactive experience, thereby enhancing the brand's value.

2.4. Cultural Innovation Design Analysis Mode

Shaping is the final result of the entire cultural innovation and design activities, and is the overall performance of "function and aesthetics" and "technology and human nature". It can be seen that the shape of the product includes design elements of different proportions and the combination of factors of different proportions results in different shapes. It meets the objective requirements of science but may not meet the personal needs of human nature. In order to explore the relationship between operation interface and engineering interface, human factors engineering expert Kreifeldt [32], of Tufts University in the United States, put forward the human factors system design and analysis mode of "user—product—task" [33]. Besides the operation interface and engineering interface, a product also needs a decorative function or an aesthetically pleasing interface. The operation interface provides an easy-to-use product, the engineering interface gives a usable product, and the aesthetic interface presents a pleasant product; a balance between the three is a well-designed product. In terms of cultural innovation design, Professor Kreifeldt proposed the relationship between operational interface, engineering interface, and aesthetic interface, which is worth studying as a reference for cultural innovation design.

Culture is a way of life that was formed by a group of people who put forward life ideas (creative) under the nurturing of the culture existing at that time. Through the products of daily life, a life taste (form) was created, and the recognition of more people formed a fashionable lifestyle (ritual). The driving force of creativity is that designers extract the symbolic meaning of a particular lifestyle, convert the symbolic meaning into visual consumption symbols, and then design these consumption symbols into life products to become creative commodities. The industry is the medium to realize cultural creativity, mainly to show some life ideas, in order to form a brand, promote life taste through brand marketing, and, finally, meet consumers of a certain lifestyle with innovative products. It then continues to promote and expand implementation, so as to create a cultural and creative industry. From the perspective of culture, lifestyle is a kind of taste realized by culture, design creativity, and industry.

The so-called "start from culture, form in products, and use for life", the core of the cultural and creative industry, is that craft (culture) forms business (industry) through creativity (design). How to turn craftsmanship and creativity into business is a question that the cultural and creative industry must consider. Scientific and technological innovation can affect product functions. However, the more restricted by technology, engineering, or production technology, the more restricted the freedom of form (product shape) and the composition of ritual (subjective aesthetics), and the more functional the product's final shape will be. When the technological aspect of a product becomes more mature, the

expression of cultural creativity (form) will be accessible, and the presentation of form aesthetics (ritual) will be more diverse. The final shape of the product is formed through the interaction among users, products (forms), and tasks (rituals). This is also why similar products, through different designs, will show a variety of shapes [17,34] (Figure 1).

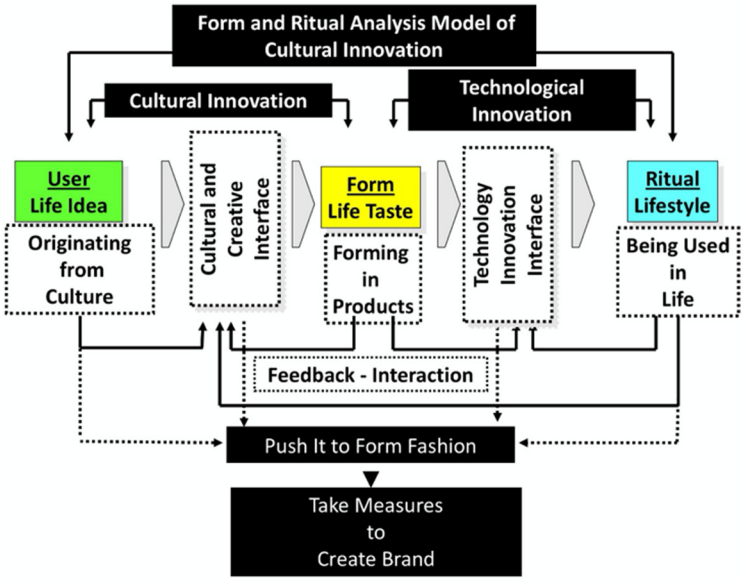

Figure 1. The Form and Ritual Analysis Model of Cultural Innovation. (Redraw from [34]. Copyright 2001 Lin and Kreifeldt).

3. Research Methods

This research uses the aforementioned cultural innovation design and analysis model, based on three major parts: cultural level, influencing factors, and situational examples. The cultural level is divided into three stages: social background, product forms, and cultural rituals. From the internal, intermediate, and external levels of culture, this research is carried out on the users' life ideas, life tastes, and lifestyles. In terms of influencing factors, life ideas come from needs, emotional responses, or inner feelings; in terms of life taste, they need a tool (form) to express this need, and the product of daily life needs to consider its usability and behavioral feelings so that there are different forms of demand. As far as lifestyle is concerned, it is not only manifested in life culture, but also a ritual outside the form.

According to Rungtai Lin [35], data are raw facts; information is organized data, which is a substantive description of data; information in the context of individual role, learning behavior, and experience is knowledge. In the past, digital archives digitized the physical data of cultural relics, which were stored on the Internet and integrated into information through websites. After users access the digital archives of information for various learning, entertainment, and other activities, it will be transformed into meaningful knowledge for users. Therefore, this principle is adopted in the transformation stage of cultural innovation design, and the process of cultural innovation research is used as the basis for the user to convert from data to information to knowledge. In the process of transformation, systematic research will be carried out on the three transformation processes of data value addition, information value addition, and knowledge value addition. The corresponding application experiments of cultural innovation design will be conducted to verify that these three types of value-added activities can be used in the application mode of cultural innovation design in the future. For the correlation analysis between user (life idea) and form (product, life taste), user (life idea) and ritual (culture, lifestyle), and form (product, life taste) and ritual (culture, lifestyle), the relationship between each are shown in Figure 2 [36].

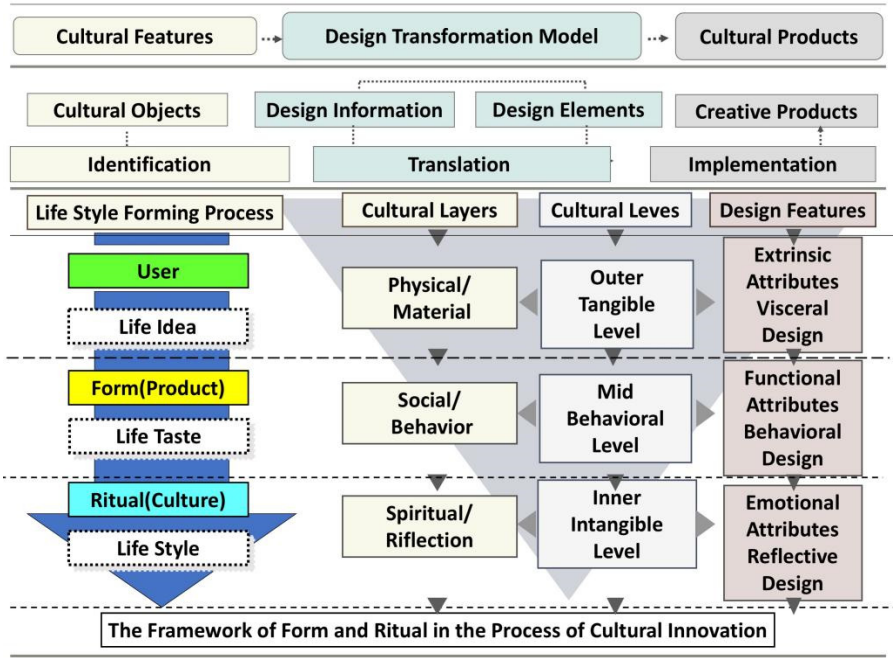

Figure 2. Value-added Model of Cultural Innovation Design from Form to Ritual. (Redraw from [36]. Copyright 2016 Lin and Chen).

The services provided by tourism constitute experiential services, focusing on the experience of tourists when they interact, rather than just the functional benefits of the products and services provided [37]. The wisdom of our ancestors has gradually evolved into cultural heritage in the long river of history, and cultural heritage needs to be carried by tangible materials, and its cultural relics reflect the beauty of our ancestors' craftsmanship. Through cultural relics, the aesthetic feeling of culture and art can make modern people think of the ancient times and benefit from the interpretation and communication of culture. With the addition of design, the purpose of cultural innovation is realized, and the intuitive design of external attributes is completed. While inheriting the beauty of ancestors' culture and art, we should add modern technology to the design, strengthen the functional attributes, make it have better practical functions, and realize life innovation. At the same time, through the writing of stories, it can enhance the emotional experience of the audience, strengthen the emotional attributes, and reflect the humanistic design, so as to realize the marketing of brand entrepreneurship, better shape the culture, and add value to help the preservation and dissemination of cultural heritage. Cultural relics begin with customs, and are more imitating memories, showing the creator's living skills; cultural creativity originates from culture. Through design, it attempts to reproduce memory and reflect users' life ideas; life innovation takes shape in products, extends memory through the practical performance of products, and presents life taste through forms; brand entrepreneurship is used in life, through internal emotional communication and even subversion of memory, new emotional experience is obtained, and the lifestyle is shaped by rituals. In the design process, it is first necessary to analyze and identify cultural relics. After analyzing the design information, the designer translates and transforms the imitation memory with the emphasis on copying, reproduction on the replacement, extension on strengthening, and subversion on remodeling, then integrates design elements into the design process, and finally completes the design and realizes creative products. Through the transformation of forms and rituals, the completion of cultural and creative brands can bring benefits and enhance cultural transmission. At the same time, it can well protect cultural heritage with continuity, improve the economic income of local people, achieve poverty alleviation and prosperity, and bring about the sustainable development of culture and economy (Figure 3).

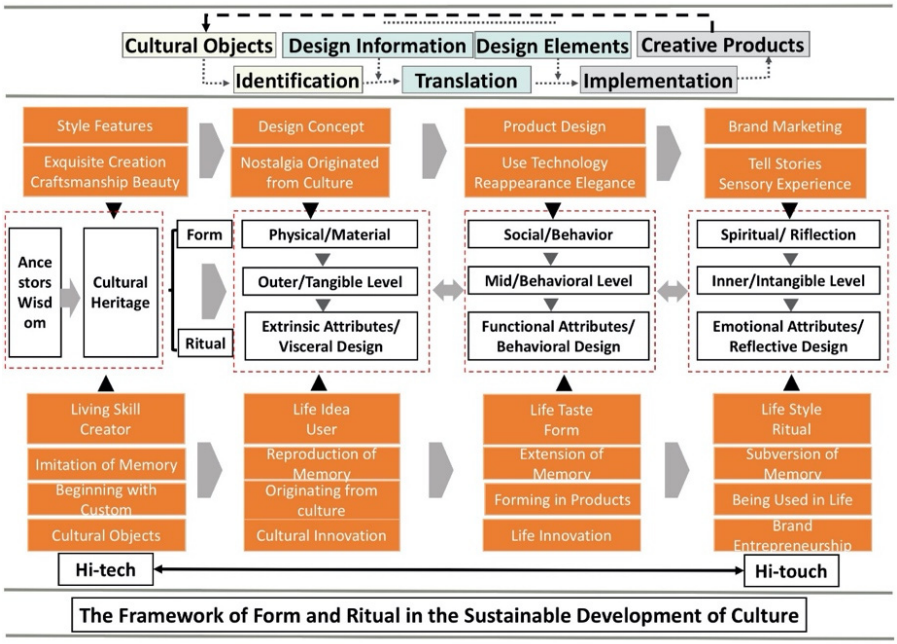

Figure 3. Cultural Sustainable Development Model from Form to Ritual. (Redraw from [17]. Copyright 2015 Lin and Kreifeldt).

In the development of China's civilization for thousands of years, wine has penetrated almost all social life fields. It has been determined by people with a conventional pattern, which is also one of the important pillars of food culture. The special influence of wine on people's psychological states and the social media function of wine make wine closely related to lifestyle and other cultural phenomena, and have a profound impact on people's lives. The wine culture of ethnic minorities has unique cultural characteristics, and behind the customs are the unique values of the aborigines. The drinking customs accumulated by ancestors and the cultural relics handed down are also valuable resources of intangible cultural heritage, which are of great value for mining local tourism resources. Yi nationality is the sixth largest minority in China, mainly distributed in Yunnan, Sichuan, Guizhou, and Guangxi Provinces; Dong people are mainly distributed in Guizhou, Hunan, Guangxi, Hubei, and other provinces; Lisu people are mainly distributed in Yunnan, Sichuan, and other places, mostly living in mountainous areas; Dulong people are one of the ethnic minorities with a small population in China (in 2021, the population was 7310, mainly distributed in Nujiang Prefecture, Yunnan Province); Paiwan people, with a population of about 60,000, are distributed in Kaohsiung, Pingtung, and Taitung, Taiwan. This study selects the Zhuanzhuanjiu (Turning wine) of Dong and Yi ethnic groups, Tongxinjiu (Concentric wine) of Lisu and Dulong ethnic groups, and the Lianbei (Continuous cup) of Paiwan ethnic groups in Taiwan as research cases. The above cases all share wine by drinking together, which not only carries the cultural memory of aborigines, but also reflects living skills and life ideas. The critical purpose of this study is to explore the sustainable development of culture from the form and ritual through the support of cultural creativity. As an intangible heritage among tangible heritage, shared national memory is vital to stimulate the close relationship between nation and culture, and can enhance their sense of national identity [38].

4. Case Analysis and Discussions

Since ancient times, wine has been the catalyst to warm people's social activities, and it is also an indispensable drink in people's everyday life. In daily life, wine is needed for celebrations, and also needed for sacrifices. If you are happy, you need to drink; if you are disappointed, you also need to drink. Drink when you have something to do, and drink when you have nothing to do. Common sayings such as "a thousand cups of wine are scarce

for a confidant", "the intention of the drunken man is not in the wine", "the wine is not intoxicating but one is self-intoxicating", and so on explain that drinking or its process is a kind of spiritual enjoyment or emotional integration. Drinking is a sacred social activity for aborigines. All ethnic groups pay great attention to drinking utensils and make appropriate drinking utensils according to the principles of customs. The interpersonal relationship shown by drinking wine together still has special significance in modern society [18,19]. Life ideas comes from life culture, based on life needs, or emotional expression, or feelings. From the perspective of cultural significance, sharing and harmony are its main ideas, and it is also the most distinctive place in the cultural connotation of drinking together.

4.1. Zhuanzhuanjiu of Yi and Dong Nationalities

Zhuanzhuanjiu is a drinking form in which several people sit around, share a wine pot and a wine bowl, and pass on the same drink in turn in a certain way. It is popular in Yunnan, Sichuan, and other places. In the southwest ethnic minority areas, it is often seen that three or five people sit around in groups in the fields, on the roadsides in front of the mountains, or in the street markets, with a wine pot and an earthen bowl containing wine in the middle. People pass the wine pot or wine bowl in a certain direction, drink a sip of wine, tell a joke; everyone gets along with others and laugh with heads tilted backward. Until the pot is empty, they bid farewell with a smile [39]. The Yi people in Liangshan, of Sichuan Province, when there are too many people and too few cups to drink, will surround themselves on the spot; each person will take a sip, pass the wine cups in turn, and drink in turn, and those who see it will have a share. Everyone will drink in moderation according to the amount of wine, and no one will drink more or less. Sometimes the wine bottle is used to drink directly, which is commonly known as Zhuanzhuanjiu. It is a kind of wine etiquette for Yi people to enhance friendship and exchange emotions. In terms of regulating the relationship between the Yi people in Liangshan, it plays an irreplaceable role in reconciling interpersonal relationships, healing spiritual wounds, comforting grief, softening or strengthening people's will, and bonding the emotions of men and women [40].

The "Tasting New Festival" of the Dong people in Zhijiang, Hunan Province, is held every June when the early rice festival opens. Hundreds of men, women, and children in the village will form a circle around the tables and benches. Drinks and dishes are displayed on the table. This is the noblest hospitality etiquette of the Dong people—"Closing Banquet", also known as "Hundred Family Banquet". Zhuanzhuanjiu is the opening and final play of the closing banquet, which consists of three steps: Step 1—hundreds of people on the scene fill up the wine, and everyone holds a cup with their right hand and arms each other in a circle; Step 2—everyone sings the wine songs together and walk around the table; Step 3—turn back to the original seat, raise the cup to the mouth of the person on the right, and everyone will drink at the same time. Usually, both the host and guest should walk around the table with arm in hand for two rounds and have two drinks. The first cup turns to the right, which is called "start right smoothly left", and the second cup turns to the left, which is called "start left smoothly right", which means to wish the guests and hosts a happy reunion and that everything proceeds smoothly [41].

Figure 4 shows that ethnic minorities apply the traditional custom of Zhuanzhuanjiu to tourism experience projects. A and B are the traditional customs of Zhuanzhuanjiu of the Yi nationality. People sit by the stove or on the grass in a circle to share wine and promote friendship. In fact, it is the reproduction of cultural heritage customs and the imitation of memory. C and D are a turning wine for the Dong people. They place several tables together into a long strip. Everyone joins hands in a circle, sings a toast song while going around the circle, and then drink wine together, mostly indoors because this is not affected by the weather. The atmosphere is intense, originating from the unique local culture. They enrich the form and content according to their needs, allowing participants to experience life ideas and reproduce the memories of intangible cultural heritage. F and G are large-scale outdoor activities with a large number of people, commonly known as the Hundred Family Banquet. The table is in the shape of a concentric circle, which can

accommodate hundreds of people at the same time, and they deeply experience the custom of drinking wine, which means reunion and completeness. According to tourism needs, the custom innovates the form, presents the taste of life, and extends the local cultural memory. E and H are innovative ways of entertaining tourists. During dinner, 4–5 local men or women, each holding a pottery bowl, pour the bowls in order from high to low as the rice wine is continuously poured. Accompanied by a toast song, the guests drink the wine in the bowl at the lowest point. Because of the continuous pouring of wine, there is a feeling of inexhaustible drinking. The form is taken from the beautiful scenery of natural mountains and flowing water, and also implies continuous friendship and blessings. This form only toasts one guest at a time. It is suitable for essential guests or when there are few tourists. It reflects the lifestyle through ritual and boldly creates and subverts the traditional memory. Tourists have shaped the brand characteristics in the in-depth experience.

Figure 4. Tourism Experience Conversion of Zhuanzhuanjiu Wine. (Source: this study).

4.2. Tongxinjiu of Lisu and Dulong Nationalities

Tongxinjiu is a crucial way for the Lisu people in Yunnan Province to eliminate contradictions and estrangements, and to communicate interpersonal relationships and feelings. The two share a bowl of Tongxinjiu, the primary method to connect feelings, enhance friendship, and eliminate estrangement. When old friends meet, they cross their arms and tie their necks, and drink a bowl of wine in one gulp, and their emotions are deepened; when boys and girls drink Tongxinjiu, their life together will be determined; when friends have suspicions or conflicts, after drinking a bowl of Tongxinjiu, old enmities and new resentments will melt away [42]. Tongxinjiu reflects Lisu's warm and bold national character, shows Lisu's deep affection for their relatives and friends, and implies "one heart and one mind". At present, there are about six ways to drink Tongxinjiu: the first way is Yahabazhi (stone moon wine). When drinking, people stand around the table, holding a wine cup in their right hand and holding a friend or guest in their left hand. The shape resembles a full moon. After the toast song, everyone drinks the wine together, reflecting solidarity, respect for friends, and sincerity. The second way is Sannizhi (three

rivers flowing together in wine). Three people put their left hands together and close to each other. The cup on their right hand winds anticlockwise to form the shape of Jinsha River, Lantsang River, and Nujiang River, symbolizing the three people working together to create a better future. The third way is Rankazhi (warrior wine). This comprises the "strong see off wine" sent by the elders to the warriors and the "welcome wine" for the warriors to return in triumph, which means that they have incomparable courage and determination to overcome all difficulties. The fourth way is Puhuazhi (fortune wine). Two people cross their cups and hook each other's wrists. At the same time, they hold each other's hands with their hands and their lower limbs also cross. The number eight is formed up and down, implying the excellent wish for success and wealth. The fifth way is Sijiazhi (missing wine). Two people face to face, with their right hands around each other's neck and their left hands supporting each other's back, or holding their shoulders and face close to each other's face and their mouths close together, drink together at the same time, implying "one mind". The sixth way is Rishizhi (longevity wine). When honoring the elders, the younger generation holds the wine cup with both hands and kneels in half. The cup should be lower than the elder's cup. They clink the cup and drink together, reflecting their respect for the elderly [43].

During a wedding ceremony for people of Yunnan Dulong nationality, the parents of both sides of the marriage hand the couple a bowl of rice wine. The bride and groom take it with both hands, hold the bowl, and drink it with their faces close to each other. It is known as Tongxin wine, which symbolizes never separating and growing old together. At the wedding ceremony of the Bulang people in Mojiang, a bottle of watery wine is placed on the table, with two curved bamboo poles inserted in it. The bride and groom drink wine together, wishing that they love each other and grow old together. In addition, the custom of newlyweds drinking together also exists among Wa, Bai, Jingpo, Achang, Pumi, and other ethnic minorities. When the Lahu people get married, the bride and groom should drink a bowl of clear water together, indicating that their hearts are pure and the husband and wife are of one mind and will grow old together [44].

Figure 5 shows the conversion mode of the tourism experience of Tongxinjiu. The pictures show two, three, and then many people drinking together. Whether there are two, three, or many people, the common point is that they all use the wine from the same utensil. A: Two people drinking together, with most pairs being couples, lovers, relatives, and friends. They can enhance their feelings by drinking together, which reflects unity. Between lovers, it also implies growing old together, imitating memory through customs. B: Three people drinking together is based on the metaphor of the Jinsha, Lantsang, and Nujiang rivers in nature, and natural harmony refers to emotional harmony, which originates from the cultural reproduction of memory and reflects cultural creativity. C and F: GanganJiu (rod wine) is shared by many people. Multiple hollow thin bamboo rods are inserted into the pot, with many people forming a circle and drinking together at the same time. Drinking together implies one mind. E: Khmu people in Xishuangbanna, Yunnan Province, place a pottery pot wine in the middle. People sit down and form a circle and each person takes a bamboo pole, with many people drinking together at the same time. Through innovative forms, the memory of traditional culture is extended. D and H: Lanmenjiu (gate wine) is an innovative form. It is usually set at the entrance of the village or at the door of the house. Tourists will be stopped and local women will present wine vessels made of long and thick bamboo. Several small bamboo branches are arranged on the bamboo as openings. When drinking, many people are in a row side by side and operate harmoniously. They drink together during the toast song to experience the hospitality of the local people, and also feel the beautiful meaning of concentric wine. The whole process has a strong sense of ritual, breaking the traditional form of two or three people drinking together in an in-depth experience, adopting the way of subverting memory to shape the lifestyle and strengthen people's understanding of the local culture.

Figure 5. Tourism Experience Conversion of Tongxin Wine. (Source: this study).

4.3. The Lianbei of Paiwan People in Taiwan

Taking the drinking utensils of the Paiwan ethnic group in Taiwan, using the Lianbei as an example, through the discussion of aboriginal life culture, this paper attempts to understand the cultural connotation (life idea) of the Lianbei, how to measure the harmony (life taste) of its operation when used by two people, and how to show the shared culture (lifestyle) in life with the Continuous cup. It is speculated from the relevant literature that Paiwan people have the habit of drinking a cup of wine together in their daily life, which later evolved into a form of special drinking cups, and then formed a cultural ritual in their lifestyle. The process is shown in Figure 6. The Continuous cup is mostly used in weddings, ceremonies, or tribal festivals. The two people who are drinking must operate harmoniously at the same time to complete the drinking action. It not only connects each other's friendship, but also conveys the warmth and harmonious feeling between people. Drinking utensils have cultural connotations of form and ritual in tradition. In addition to the cultural connotations of Paiwan cups, it is worth studying the evolution from traditional single drinking utensils to interesting two-person drinking utensils [17,18]. Lianbei is a life product design that expresses the harmony of human nature by Taiwan aborigines. In addition to the shape of the Lianbei, the size of the human body needs to be considered, while its operation must also comply with human factors engineering. It can reproduce the spiritual enjoyment in the process of drinking or achieve the emotional integration of drinkers. This kind of life utensil is full of humanity and wisdom, and is what modern life products lack.

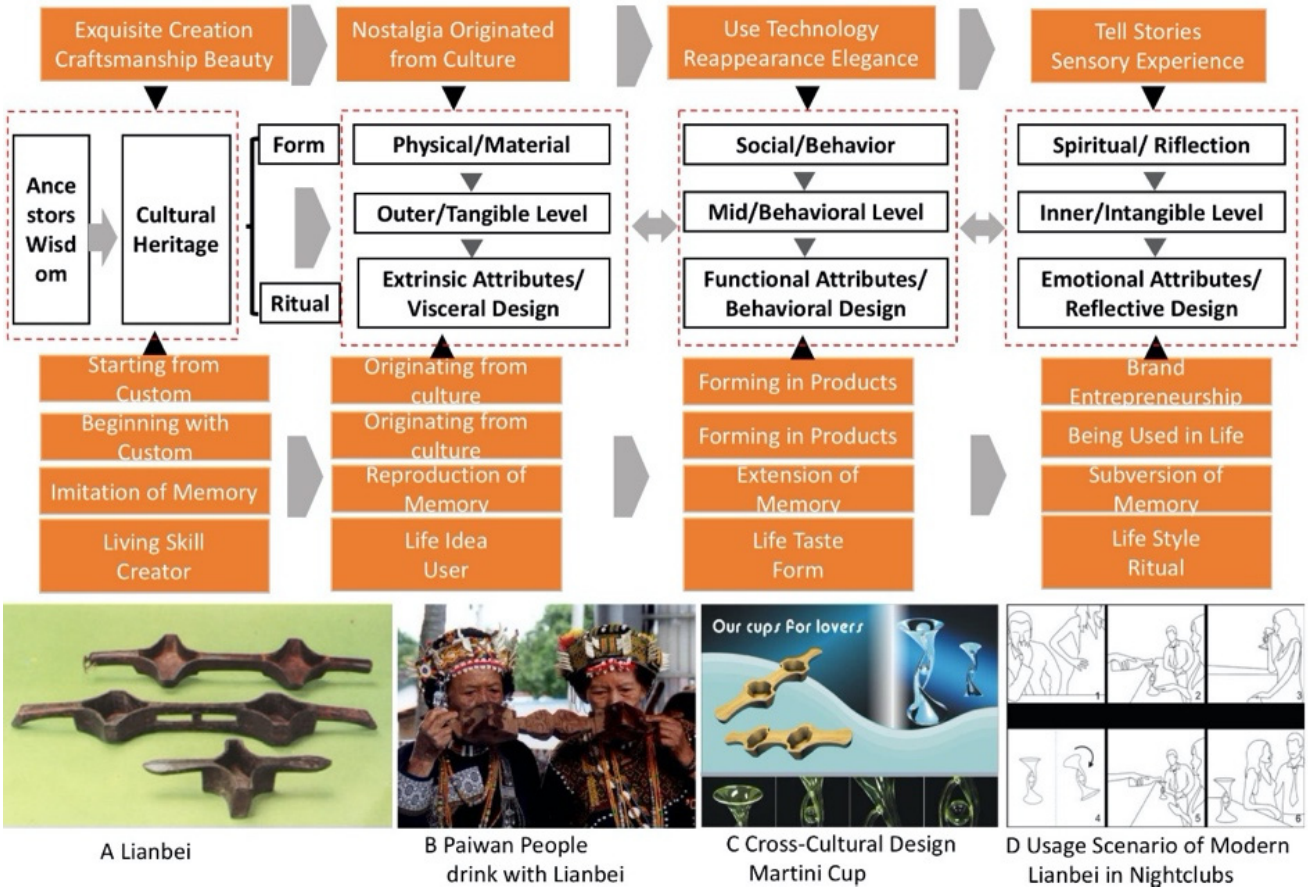

Figure 6. Creative Design of the Continuous Cup. (Source: this study).

The significance of the Lianbei in the Paiwan nationality is to convey the meaning of friendship. In the modern nightclub culture, it is also through drinking to make friends. Therefore, the cultural meaning of friendship conveyed by the Lianbei has been transformed into a modern life culture with nightclubs as the background—the Martini cup is an interpretation of the modern nightclub dating culture and echoes the original cultural connotation of the Lianbei [17,18]. In Figure 6, C is the Martini cup designed by Yanting Guo, Yipei Zhang, and Mingxian Sun from the Institute of Craft Design, National Taiwan University of Arts, who won the Golden Prize in the Pompeii Martini Cup Design Competition in Taiwan and participated in the international competition in Italy on behalf of Taiwan. The design concept is to transform the original horizontal side-by-side-linked cup into a vertical symmetrical form, and add the cultural meaning of the aboriginal-linked cup to the traditional form of the Martini cup, which is a typical cross-cultural design of the cultural exchange between the East and the West. This combination of traditional and modern dating mediums allows people to make friends decently and unrestrictedly in the environment of nightclubs, through the cups that symbolize friendship. The usage scenario is shown in Figure 6. The overall shape shows a well-conceived sense of design, expressing the texture and artistic sense of the medium through glass, and giving full play to the spirit of Taiwanese local craftsmanship. From the cultural point of view, the sharing is the unique character in the shape and meaning of the cup. Therefore, the design team started brainstorming according to the characteristic of sharing, and classified many words similar to sharing, including the connection of heart and hand, the connection of heart and mind, the connection of heart and heart, the integration of mind and matter, in pairs and couples, the killing of two birds with one stone, the pairing of two, the exchange of emotions, the one hundred years harmony, and so on. From the stirring words, the design team believes that emotional communication is a phrase that can express the figurative and abstract

connotations of the cup. Therefore, emotional communication is further considered as the development direction of design. From the relationship between drinking and emotional communication, it is outlined that nightclub culture can fully express this characteristic, that is, make friends through drinking and then achieve the effect of emotional communication, joy, and relaxation, and indirectly echo the Lianbei of Paiwan people which conveys the cultural meaning of friendship, sharing, and celebration among ethnic groups.

4.4. Discussions

In this research, three case studies were used to examine the role of intangible cultural heritage and sustainable development. Through research, it can be seen that in tourism activities, people have shifted from the pursuit of Hi-tech (functionality, rationality, and high technology) to the pursuit of Hi-touch (high feeling, human nature, and touching experience) [17]. It can be seen in the system of wine, people, and environment that the process-oriented dialogical and place-specific is the basis of the evolution of design form [16]. Through the analysis of drinking together by different ethnic groups, it is found that there are commonalities in the drinking culture of different ethnic minorities, including: (1) Carrying shared values; (2) Embodying the character traits of simplicity, enthusiasm, and interaction; (3) Paying attention to the communication mode of joint cooperation; (4) Presenting a life attitude of harmonious coexistence with nature.

Through the cultural characteristics of drinking together, the designer allows tourists to stimulate their interest and improve their cognition in the interaction between form and ritual through on-site viewing, interaction, tasting, and other personal experiences in ethnic minority areas, so as to finally share a moving experience and complete the dissemination of culture. Figure 6 shows how designers master the cultural connotation, and the creativity of cultural and creative commodities through starting from customs, originating from culture, forming in products and being used in life, and through imitation of memory, reproduction of memory, extension of memory, and subversion of memory, to show the connection between intangible culture and modern life through memory in the process of cultural creativity.

How to improve emotional cognition in interactive experience is the focus of designers' consideration. Based on the model of sustainable experience design for local revitalization [45] and the analysis of the above three cases, this study proposed a framework of sustainable experience design from the perspective of the aesthetic economy from form (Hi-tech) to ritual (Hi-touch), as shown in Figure 7. It can be supported to create a perceptual field, provide a moving experience, and construct a sensory life from the three aspects of form, ritual, and scene, so as to turn the unique culture in the intangible cultural heritage into a business through creative design, in order to achieve sustainable development of the cultural industry.

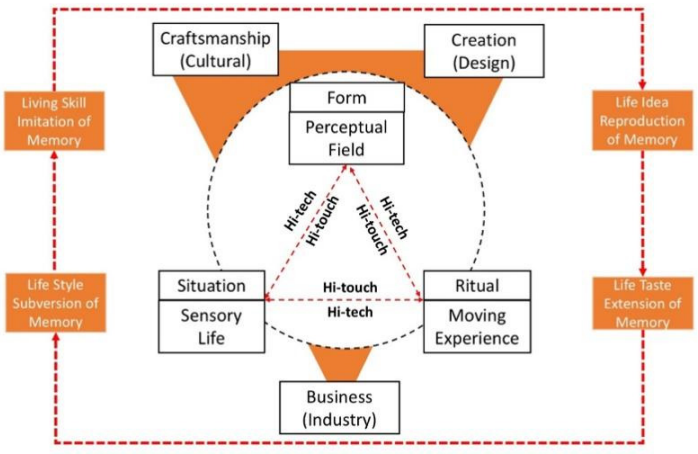

Figure 7. Sustainable Experience Design Model of Intangible Cultural Heritage. (Redraw from: [45]. Copyright 2022 Yang, C. H. et al.).

The intangible cultural heritage in ethnic minority areas is the accumulation of the long-term life of the aborigines, with a long history and unique aesthetics. The costumes, food, architecture, religious beliefs, life concepts, and values of ethnic minorities have their own characteristics, which have unique attraction and mystery to the experience of tourists. These cultural characteristics are also vital to attracting tourists to participate in in-depth experiences. The rich intangible cultural heritage in ethnic minority areas is a precious resource with substantial value and significance in promoting the local tourism industry. When tourists watch, understand, and participate in various activities, they better understand the language, song and dance, architecture, clothing, diet, life concept, and folk skills of ethnic minorities. At the same time, local intangible culture continues to gain value in tourism, which can make local aborigines pay more attention to their own culture and encourage them to explore, protect, and inherit their unique cultural memory. Due to the influence of cultural adaptation and assimilation, foreign tourists will have specific destructive effects on local culture and environment, so it is necessary to integrate the value of local culture into development [46]. Protection must follow the living protection principle and cultural memory logic. Improvement and innovation should be reasonably designed to reflect the subject's value orientation and stimulate the participant's cultural identity. It should comply with the principle of cultural aesthetics. In order to increase attraction and entertainment, it is also necessary to create some new forms of activities [47]. A noteworthy issue is that with the entry of a large number of foreign tourists, people from different places will also allow local aborigines to gain more exchanges and contacts. How to avoid the damage and impact of foreign cultures and values on local aborigines is a significant issue. At the same time, sufficient attention should also be paid to how to avoid the damage of foreign tourists to the local environment. Precise and prudent methods should be taken, and these are worthy of further study.

5. Conclusions

This research selected three case studies with the theme of ethnic minorities drinking together. From the perspective of the interaction between form and ritual in cultural innovation, it proposes the design framework of form and ritual in cultural innovation, discusses how to reproduce the cultural connotation of drinking together in modern life, and is even used in the development of cultural and creative products to become daily necessities. The life idea of drinking together demonstrates the core values of its cultural meaning–harmony and sharing. According to this idea, the life taste of drinking together is developed. This form requires the drinkers to operate harmoniously at the same time in order to complete the drinking action. Finally, it has become fashionable to form a lifestyle. People can share wine on different occasions. Fine wine not only helps people to connect but also conveys the feeling of warmth and harmony between them. The model constructed in this study is mainly used to apply intangible cultural heritage to the development of innovative products. It focuses on how to make people know, understand, and love their cultural meaning through creative design and the interaction between form and ritual in order to achieve the goal of sustainable development and promote sustainable development of cultural industries in ethnic minority areas.

Through this research's case studies, the effectiveness of the construction model is verified. However, only three cases were selected due to the limitations of objective conditions. Whether the model is reliable in the sustainable development of the intangible cultural heritage of ethnic minorities in other countries and regions needs further verification.

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MDPI

Article

Exploring Indigenous Craft Materials and Sustainable Design—A Case Study Based on Taiwan Kavalan Banana Fibre

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Abstract: For a long time, local craft traditions were passed on through apprenticeships. Consequently, new generations of designers and industries cannot easily intervene or produce new designs. This inability to integrate craft traditions in a modern context and changing cultural environment has resulted in the stagnation, decline, or even elimination of such crafts. This study focused on the use of banana fibres in the craft traditions of the Kavalan people of Taiwan, and research-through-design concepts were applied to the creative study of materials that are essential to ecological sustainability and cultural heritage. The method, Material Driven Design (MDD), was implemented through participation to experience traditional processes and explore the visible properties of craft materials. The goal was to gain a holistic understanding of materials and leverage the participants' expertise in determining which steps in the methods could be improved. This process was supplemented with grounded theory, which was used to analyse and summarise the data in order to understand the factors influencing the creations of participants. Lastly, in addition to producing semifinished and finished products in our experiment, we believe that our findings regarding the examined materials and material tinkering to develop a material-tinkering loop based on the MDD can be (i) combined with the unique insights and technical expertise of designers and (ii) used alongside contemporary technical and digital aids to effectively support the continued development of innovative craft designs.

Keywords: banana fibre; sustainable materials; circular design; Material Driven Design; research through design; ground theory

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1. Introduction

In 2019, the Intergovernmental Panel on Climate Change stated that, because of limited resources, climate change, land and ecosystem degradation, and population growth, humans should learn and establish production and consumption patterns that account for the planet's ecological boundaries to ensure the sustainable use of land resources [1]. Scholars and industry leaders have teamed up to discuss the development of environmentally green and ecological materials and resolve social problems relating to land, food, and energy [2,3]. However, sustainable design is about more than just reducing carbon footprints and using degradable materials; true sustainability also includes the development of a new material culture that emphasises more active engagements, aesthetic significance, and emotional continuance [4]. Consequently, with an emphasis on industrial production and ecological challenges, Taiwan's government has been promoting circular economy plans, since 2008, in response to the worldwide trend of low-carbon economic development. This also involves advocating for design thinking through the use of local elements in cultural and creative industries, and circular economies that care for the land, to form an emergent consensus with international societies. For example, a Taiwanese innovative design team, Studio Lim, successfully combined traditional lacquering with modern manufacturing

by using fibre woodware made from recycled wood shavings and natural flax fibres; the resulting products are lightweight, durable, and softly textured due to the natural fibres. A wide range of natural fibres—including flax, jute, ramie, and banana—are being studied as cost-effective alternatives in the development of composite materials [3,5–7]; banana silk is also one such alternative.

The banana is a well-known fruit. From its fruit to its leaves, flower bud, banana steam, and pseudostem, every part of the banana plant can be used. Banana fibres are valued for being lightweight yet stiff and having favourable air permeability and water absorption. In addition, the chemical composition of bananas is rich in cellulose and lignin, but its lower fibre content relative to hemp results in reduced softness, and its high lignin content results in poorer spinnability. Furthermore, the pseudostem of a banana, which is the main agricultural waste that is discarded in banana harvesting, can be effectively used to mass produce banana-fibre products such as banana planks [8,9]. The Swiss backpack brand, QWSTION, sells backpacks made with Bananatex, a waterproof fabric created using 100% natural banana fibres from bananas unique to the Philippines. The Kavalan people of Taiwan, an indigenous tribe based in the eastern region of Hualien County, have preserved their traditional banana-silk weaving techniques, which are registered as an intangible cultural asset by the Taiwanese government because of their cultural uniqueness and ecological sustainability [10]. As the production of ramie threads is seasonal, the Kavalan people switched to banana silk as an alternative material in livelihood crafts for making such items as traditional clothing, backpacks, tote bags, straw capes, straw mats, and decorative screens. Evidently, banana fibre is more than a renewable and self-replenishing resource; it represents an opportunity for people to connect with a meaningful material culture. However, these craft materials and skills are not systematic in terms of design innovation and, consequently, when designers and industries intervene in process development projects relating to craft materials or techniques, they may explore each design projects only through design thinking. Therefore, this study established modern design and innovation values of craftsmanship through the step-by-step completion of a manufacturer process involving materials made from natural banana fibres, including the use of grounded theory to discover, develop, and verify through data collection and analysis.

2. Literature Review

2.1. Value of Indigenous Craftsmanship and Sustainable Designs

Traditional crafts are mostly made from natural materials and reliant on artificial processing and the use of ecological resources. In recent years, challenges relating to the transfer of the world's intangible cultural heritages [11], the role of creative industries, ecological and sustainable management, and the representation of local culture have shone a spotlight on the craft industry and craftspeople. To address challenges related to sustainable design, traditional crafts also incorporate values that are linked to the regional context, cultural knowledge, and practices [12–14].

Crafts are environmentally friendly because they emphasise hand processing and the use of natural and renewable materials such as wood, wool, and plant dyes. In the context of the local use of natural materials by the craft industry, these materials determine the longevity of economic sources for stakeholders; consequently, the renewability of materials has received increasing attention [15,16]. The social anthropologist Michael Howes stated that the knowledge base and practices of indigenous peoples can often be utilised to emphasise the sustainability of the environment and human communities, especially in localised ecosystems [17]. Howes argued that this knowledge must be explored and applied in the development of modern science and technology. Benyus contended that most indigenous peoples abide by the ecological laws of nature and formulate, on the basis of respect for nature, codes of conduct that apply to hunting, gathering, and fishing. Hunting animals needlessly or wasting any part of an animal are considered taboo behaviours [18]. According to Polanyi (1997), craft knowledge is transferred as tacit knowledge, which is typically described as the concept of "we can know more than we can

tell" [19]. This also indicates that crafting is the formation of tacit knowledge through the physical movements and practices of craftspeople [20]. Tacit knowledge is also defined as a type of bodily kinaesthetic intelligence in which the connection between perception and conceptual thinking is limited [21,22]. By contrast, Adamson argued that a craft is, by definition, a practice and also a method of thinking that is realised through various practices; this method of thinking can be broken down into category, object, idea, and process [23]. Each category of craft (such as pottery, woodworking, and lacquering) has its own material knowledge, techniques, and processes and influences the thoughts of creators and the execution of object creation through various cultural symbolisms, implications, and emotions [24,25]. Adamson further defined craft as the act of "making something well through hand skill" [23], emphasising the role of hand skill in craftwork. The consumer market's increasing rejection of innovations led solely by technology highlights the key role of crafts in the development of innovative products. The emphasis on visual, tactile, and emotional qualities can be attributed to the creativity inspired by the crafting process, the ability to convey meaning through form, and the sensitivity of people to materials [20,22]. Therefore, by presenting the value of hand skills in craft, a greater emphasis is placed on discussing the nature and manufacturing process of craft materials and the process of forming objections.

2.2. Material Designs in Material Driven Design

Karana et al. (2015) published "Material Driven Design (MDD): A Method to Design for Material Experiences" to establish a record of designers' designs and experiences with materials at hand and understand how a material behaves under different circumstances or reacts to different techniques or manufacturing processes, the interpretation of materials, and design behaviours driven by materials, with the purpose of guiding the development of materials [26]. The MDD method emphasises the designer's process, which moves from the tangible to the abstract and then back to the tangible, in addition to the journey of a material from the final design stage back to hands-on experimentations, material priming, and prototyping [27]. The method comprises the four following steps: (1) understanding the material (i.e., technical and experimental characterisation); (2) creating a visual experience of the materials; (3) manifesting material experience patterns; and (4) designing material/product concepts. The MDD method also emphasises how the potential properties of a material can guide specific forms of manipulation [28], such as material tinkering, participants documenting the material-making process to build knowledge on material tinkering, and collaborations between material stakeholders [23,26,29–32]. By reviewing their understanding of the continuity among the design, timing of use, and structure of the materials, researchers can introduce new steps or a material taxonomy to analyse material growth environments, compositions, processing, and structures and thereby produce new findings related to the role of materials and the experiences of users. Consequently, the MDD method allows for the development of derivative forms, functions, and experiences of materials that are not yet fully developed [33]. Relevant examples include materials made from recycled waste (e.g., mussel shells) [34], 3D textiles and printing [35], organic biomass materials (fungus filament) [36,37], smart materials that require further development [38], and the development of artificial textiles made from plant roots [39].

The Kavalan people of Taiwan have been weaving and crafting with banana fibres for more than a century [40]. The MDD step of understanding material characterisation stresses developing an understanding of raw-material collection, especially regarding the acquisition techniques used in traditional crafting and the historical and cultural knowledge of materials. Meanwhile, how these materials interact with users under various conditions (e.g., compression or varying temperatures), what issues arise related to these materials (from a human perspective), and how people respond to these materials [28] are also significant. Moreover, by studying the continuous relationship between innovation and inheritance, anthropologists can examine the cultural information pertaining to the creation, use, or transformation of objects by humans within the context of material culture;

this includes the conversion of raw materials into products, artefacts, and objects and its implications for the evolution of life [41,42]. Ingole's proposal of different materials and material variability is illustrated in Figure 1. The connection between objects and human life can be envisioned as two lines flowing in parallel; specifically, one line represents the flow of consciousness in the form of life, sound, and sensations, whereas the other line represents the flow of materials that circulate, mix, and merge. Along the two vertical flow paths, two horizontally aligned nodes—image and object—are generated [43].

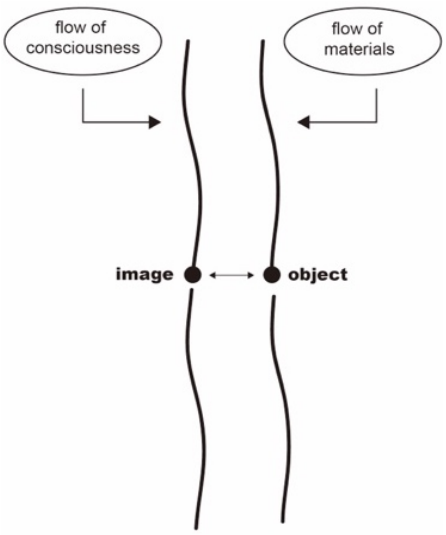


Figure 1. Transfer flow between image and object in material cultures (re-illustrated in accordance with the map of Ingole's theory).

That is, in the flow of consciousness, the cultural connotations of a craft that are conveyed through objects are regarded as characteristic representations of a tribe's craftwork, and the emphasis on cultural values in design is naturally regarded as a key aspect of the design process [44–46]. In particular, in the strategic model of culture as product design, Lin specifically targets the four main steps proposed for extracting and transforming Taiwan's indigenous cultures in product design: investigation (i.e., set a scenario), interaction (i.e., tell a story), development (i.e., write a script), and implementation (i.e., design a product) [47].

Instead of attempting to understand the meaning and image transformation of various cultural characteristics in the flow of consciousness with respect to communication, the present study emphasises the flow of material by focusing on the MDD strategy of encouraging designers to understand the essence of tribal craft materials. This includes considering the physical properties of the material, historical background of a craft, and material weakness tinkering. These relationships drive designers to identify new ways of applying a material through scientific experiments [48]. MDD plays a key role in this process by initiating a new step in design evolution with each turn.

2.3. In-Depth Analysis of Grounded Theory and Practical Significance of the Research-Through-Design Method

Grounded theory is a contextual examination that provides researchers with a method for systematically describing the qualitative details of a phenomenon that is being studied [49]. It is used to reveal the connotations of people's experiences and to explain little-known phenomena that exist under the surface. Qualitative social-research methods are used to establish the sustainable and systematic design logic developed by designers for indigenous craft materials. Turner argued that grounded theory is particularly applicable to qualitative data, such as of participant observations, face-to-face interactive observations, semi-structured or unstructured interviews, case studies, and documentation [50,51].

Consequently, in the present study, grounded theory was used for the case studies, interviews, experience logs, and literature review at this stage (e.g., discussions of qualitative data such as the written descriptions provided by the study stakeholders and the study participants during the trial process) to inform the design practices for the next stage of the present study. According to Strauss and Corbin, grounded theory involves the collection of data within the scope of a study and subsequent analysis of the data in accordance with specific standards (e.g., systematic comparison of data texts) [51,52]. As such, the collected data were consistent with the structures of the sensitive and key questions that are highly relevant to the present study. The back-and-forth process of text-data analysis enabled researchers to repeatedly review each step, which facilitated subsequent research observations and the integration of questions and results. The data analysis results were then categorised in rational and structured tables to determine the behavioural and textual correlations between workshop participants, stakeholders in banana-fibre crafting, and documents on Kavalan crafts. Lastly, the data analysis and property results were used to develop a craft innovation model for banana-fibre materials used in design research. In the present study, from the analysis of banana-fibre materials to the application of design concepts, the presentation of design-entity concepts gradually took shape during a series of repeated design trials that were conducted by the designer. The aforementioned process describes the concept of research through design (RtD), which is realised in the field where design work is actually conducted [53]. RtD is a design method that is established through the design process, and it involves the documentation and communication of key actions such as material research, development work, experimentation, and design repetition [53]. RtD is also used by researchers as a research method for resolving various problems (incompleteness, contradictions, and changes) [54,55] and for understanding the broader design context.

Notably, RtD has two main mechanisms. The first is the defence of research specificity [56–59]; as described by Frayling, RtD treats design as a unique form of thinking and a unique method for establishing knowledge that can further our understanding of non-design topics. The second is the foundation of design research based on existing academic research precedents or methods, particularly in the context of natural sciences, social sciences, and the arts [53,60,61]. Gaver and Bowers proposed that the similarities and familial resemblances of artefacts manifested through design research can be summarised using annotated portfolios, which combine visual information with concise descriptions. The resultant intermediate knowledge enables designers to express the indexical connections of their design as research design and communication, providing them with an alternative means of interpreting and predicting the composition of a design in research outcomes [62,63]. In essence, annotated portfolios present specific design objects and provide corresponding textual descriptions; compared with the application of unsuitable scientific research methods, the intuitive explanation of evidence associated with annotated portfolios is a more appropriate method for verifying design in research [62]. Consequently, when we return to the material as a starting point in MDD to examine how the essence of materials and their samples inspire design concepts (for the purpose of highlighting the application value of crafting), we must exploit the objectives of RtD [63] to systematically examine the concepts pertaining to material sampling, material tinkering, and prototyping, and gradually adjust the designs in our study. Furthermore, the annotated portfolios were empirical designs for validating MDD practices in design research [59,60]. Lastly, the experimental product designs were completed with the application of RtD concepts and subsequently used to establish a guiding method for designers [64,65].

3. Methodology Framework

The present study took the form of community- and regionally specific craft cultivation programs that were launched by the National Taiwan Craft Research and Development Institute (NTCRI) in 2018, and it was expanded to include a craft-material-making program that was launched in 2021. The goal of these programs was to establish the sustainability of

Taiwan's local craft industry by preserving and promoting Taiwan's craft culture and by helping communities to build a consensus on the development of craft communities.

The present study was conducted in three phases (Figure 2). The first phase involved the holistic exploration and understanding of the material significance of traditional Kavalan banana-fibre crafts through an MDD design workshop. Semifinished products, which were produced through the innovative use of materials by designers and craftspeople, were used to restructure visible knowledge and construct a design foundation (Phase I). In the second phase, an in-depth content analysis was conducted in accordance with grounded theory [51], whereby local banana-fibre craftspeople (i.e., stakeholders) were interviewed to obtain an understanding of the management and development of banana-fibre crafts and the current status of actual traditional materials and techniques, and the engagement of the study participants in the exploration, tinkering, and repeated deconstruction of banana fibres during workshops was recorded. The purpose was to determine the invisible power that drives material expressions and innovative designs during exploration of the material (Phase II). Lastly, to support the results from the analysis in Phase II and to establish MDD commodification design practices, Phase III was conducted by inviting two research students specialising in product design who were undergoing received professional design training (i.e., they have product development skills that have not yet been rigidified by industry experience) to interact with the three craftspeople who demonstrated high degrees of concrete realisation during the Phase I prototyping process. The main activities were as follows.

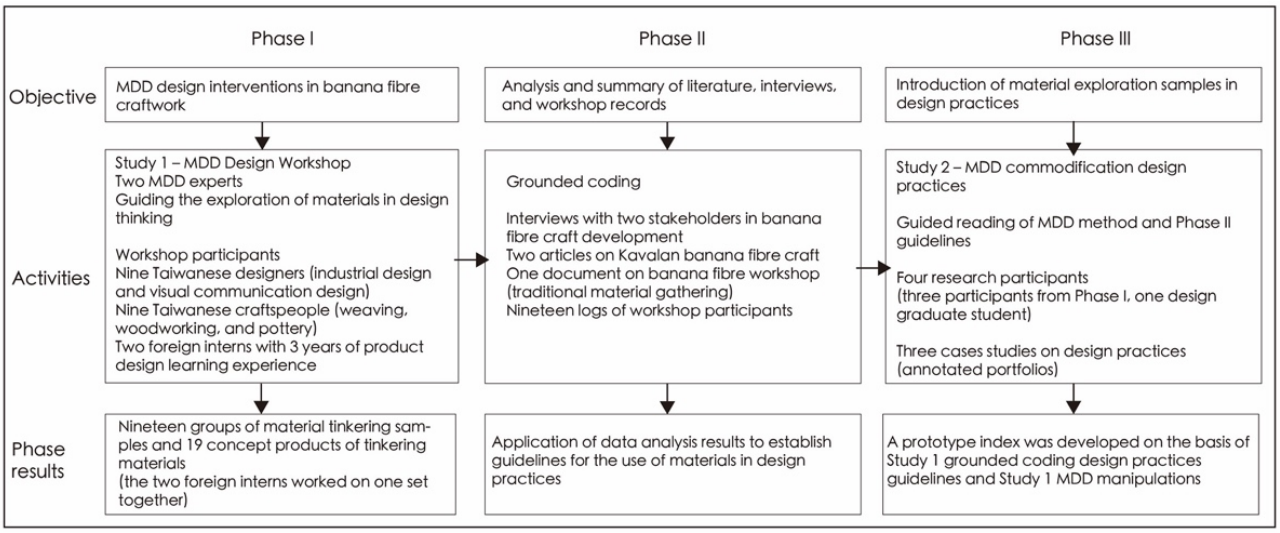


Figure 2. Details of the three study phases (Phase I–III) in terms of their objective, activities, and phase results.

4. MDD-Based Design Intervention for Banana-Fibre Craft

For Study 1, which was carried out during the workshop conducted in Phase I, the MDD method was used to apply material design and analysis methods as part of continuous research on craft-material design information. The study comprised 20 participants (i.e., nine craftspeople including potters, weavers, and woodworkers; nine designers, including industrial designers and visual communication designers; and two non-Taiwanese industrial-design student interns). Under the guidance of two MDD experts, who were invited by the National Taiwan Craft Research and Development Institute Taipei Branch (NCTRI) to participate in the present study, the aforementioned participants participated in an eight-day participatory design workshop and conducted design concept prototyping for 1 month in accordance with the procedures for traditional Kavalan banana-fibre crafting (from material collection to design-prototype concept output). MDD integrates the concept of material-culture evolution into the design intervention principles for banana-fibre

crafting; the designer plays the role of an archaeologist or anthropologist who, during the design–practice loop of material tinkering, forms the meaning of material tinkering and traces of a concept prototype or cultural information by reviewing the past and building a new material vision. Emphasis is placed on the appearance of the material prior to tinkering and the evolution of this appearance in each loop.

The banana-fibre material-preparation procedures (Figure 3), which were based on crucial information and indices in each action step of the actual operations that were implemented during the workshop, were investigated in the present study. The procedures of Phase I of the present study emphasised the translation of craft into design–concept–practice. Action Step 1 (i.e., understanding the material) pertains to the culture and background of traditional tribal banana-fibre crafting; this involved observing the material's properties and qualities and understanding both traditional and other feasible material-processing techniques (illustrated in Section 4.1). Action Step 2 (i.e., material vision) was performed on the basis of material-tinkering-related experimental information that was obtained through material analysis and the material embodiment by the users of craft manufacturing techniques (illustrated in Section 4.2). In Action Step 3, basic sensory information of the users (in relation to the material) was collected (illustrated in Section 4.3). In Action Step 4, the emphasis was on forming a loop for the process of design–concept–practice by applying the MDD-based action of material tinkering (Action Step 1); the participants introduced information related to their material experience journey into the loop, and they repeated operations and examinations through material tinkering and experimented with processing techniques and trial design prototyping, thereby echoing the design concept that was formed during the material-tinkering process (illustrated in Section 4.4).

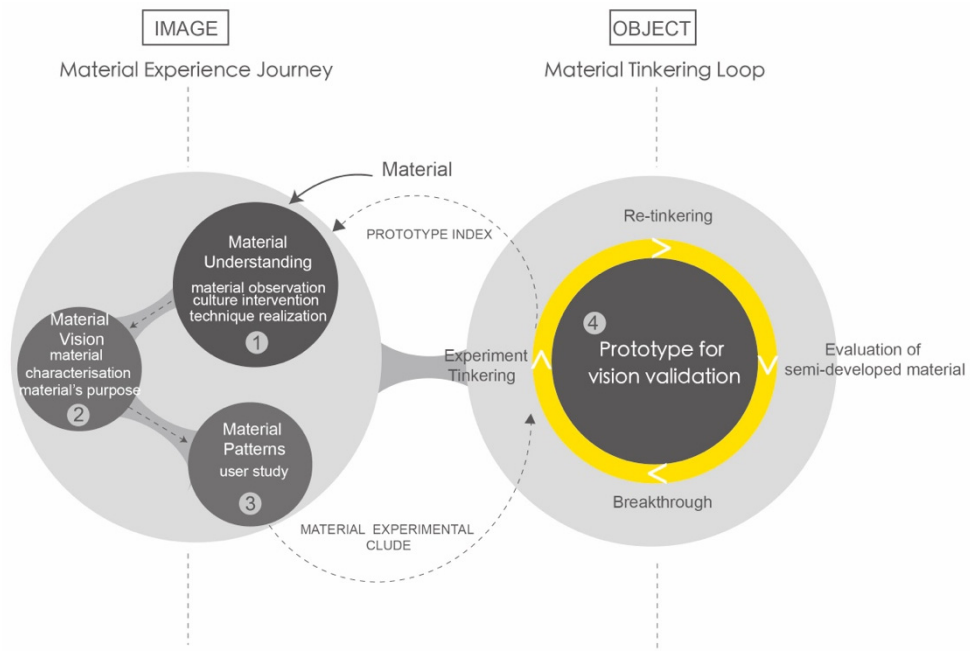


Figure 3. Mapping of banana-fibre material regeneration and innovative-design deployment.

4.1. Action Step 1: Material Understanding

Three days before the workshop was conducted during Phase I, the 20 participants and the two MDD experts visited the source of the banana-fibre material that was examined in the present study (i.e., Kavalan Xinshe Village in Hualien, Taiwan) to conduct a field study on this material (Figure 4). During this activity, the participants were asked to collect banana fibres in person. In addition, village elders and tribespeople provided guidance on traditional craftmanship, and the participants gained a deeper understanding of the history and culture of the banana-fibre material through their dialogue with the MDD

instructors [26]. Subsequently, the traditional process of banana-fibre-material making was illustrated, as shown in Figure 5, by organising the activity outcomes.

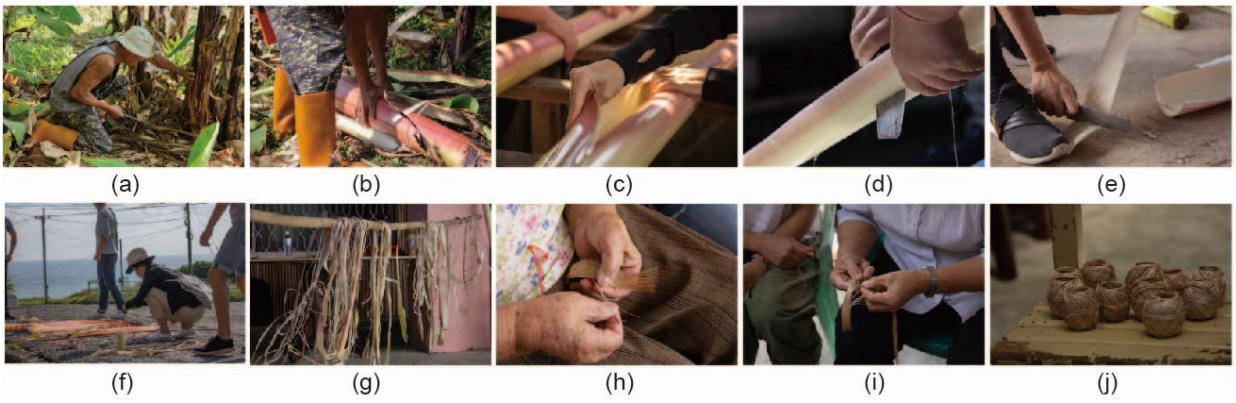


Figure 4. Material collection process. Top row: (**a**,**b**) chopping down a banana tree; (**c**) stripping sheaths; (**d**) cutting a sheath in half; (**e**) scraping the flesh. Bottom row: (**f**) exposure to the sun; (**g**) washing and dryING; (**h**,**i**) making thread; (**j**) straightening the threads into yarn. (Photographed by 1st author).

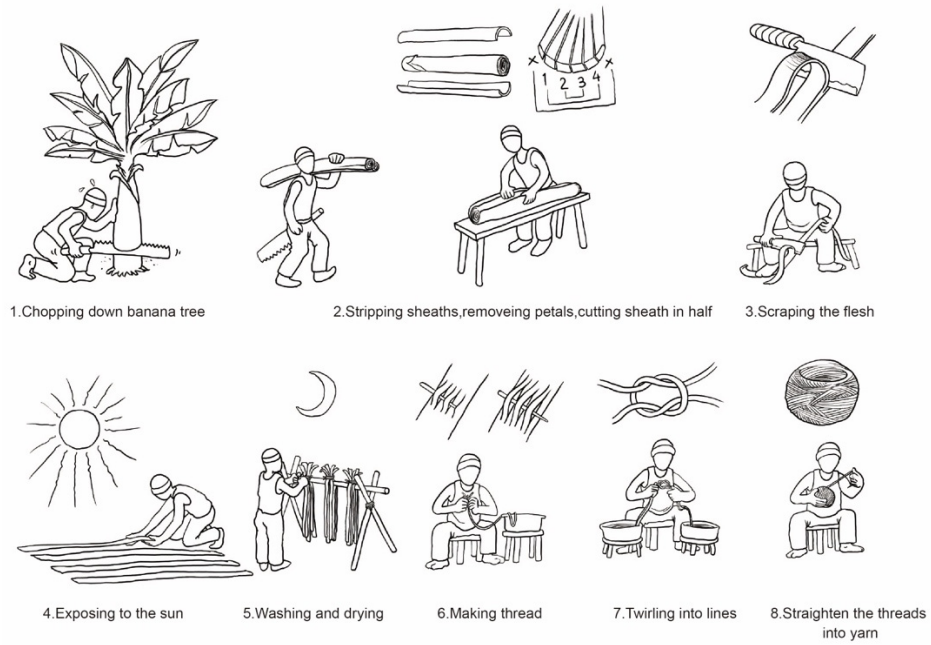


Figure 5. Conditions and procedures for traditional material collection (re-illustrated in accordance with the data provided by Shen En-Min by 1st author).

The processing and manufacturing (e.g., bending, forging, gluing, and cutting) of the material affects its performance in terms of its structure (including the microscopic molecular composition and the macroscopic visual structure) and properties (e.g., hardness and strength, which includes compressive strength and shear resistance). Accordingly, the concept of material connections classification in crafting is similar to that in materials-science technology and research. Therefore, after the participants understood the traditional manufacturing process of the material examined in the present study, they summarised its properties, preparation process, visual structure, and the growing environment by following the MDD method and preparing a material taxonomy prior to the material-tinkering activity (Figure 6); the material taxonomy served as a reference for clarifying the subsequent MDD-based material tinkering. The material taxonomy comprised four primary

components, as follows: (1) material ingredients refer to the compositional quality of banana-fibre material (including its organic natural fibre, recyclability, degradability, natural smell, and biological water resistance); (2) growing conditions refer to the growth-related environmental factors to which bananas are exposed (e.g., cultivation near a harsh seashore environment, lack of fertilisation, and insect bites); (3) material structure refers to the dimensions of material composition (including two- and three-dimensional configurations and composition heterogeneity (density and stratification)); (4) material treatment refers to material processing (including post-processing steps such as dyeing, pressing, hot pressing, and drying). The four aforementioned aspects influence one another. For example, variations in dyeing can develop because of differences between growing environments. Therefore, controlling for variations relating to coefficients or correlational factors can be highly challenging.

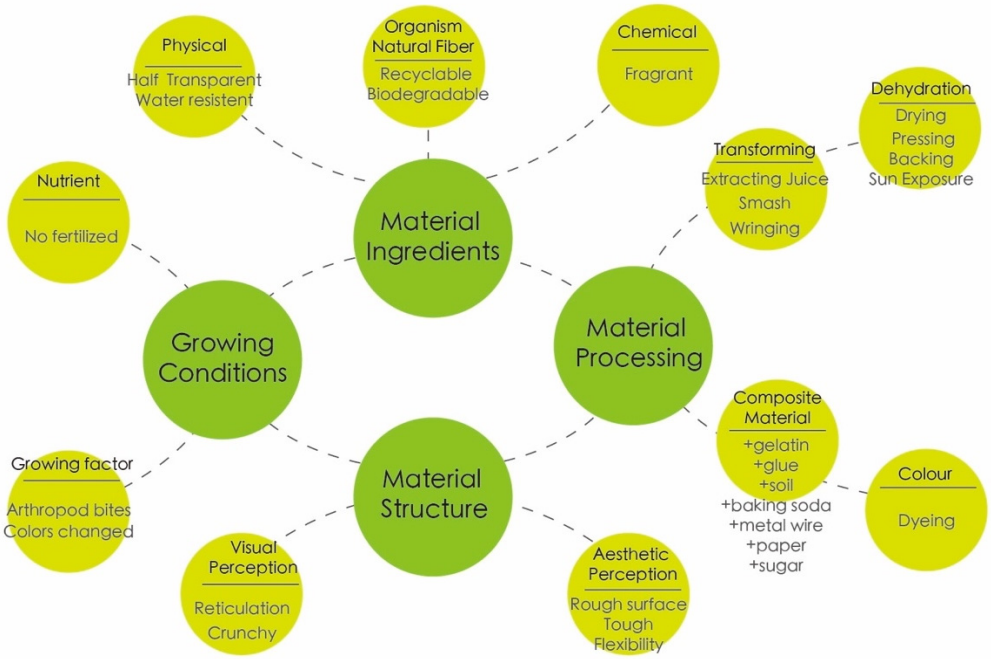


Figure 6. Banana-fibre material taxonomy that was prepared prior to material-tinkering activity (re-illustrated in accordance with the data provided by Chen Kuan Cheng (a participant).

4.2. Action Step 2: Material Vision

Building a material usage vision involves helping the participants to extract the correlation and consistency in their understanding of the banana-fibre material. This step aimed to guide each participant to reflect on correlational connections and key issues, thereby enabling them to define a key and unique vision about the banana-fibre material on the basis of their exploration. For example, the participant DF with a background in industrial-design training was intrigued by the action of "chewing" the material. The participant felt that the act of combining added materials led to interactions with other daily necessities and that repair and collage were ideal methods for expressing conflicting beauty. With respect to this topic, the participant said the following:

> *In learning to extract banana fibre as a material, I observed, through the community craftsmen's demonstration, how they retained the fibre that is suitable for weaving. The fibre did not possess the quality of a twist thread for weaving because of its inferior strength due to insufficient growth. Consequently, the core material and the split that remained after the fibre was drawn were generally used to make fertilisers (natural agricultural waste) or soy sauce. The natural structural texture of the banana's core material, the split that remains after the fibre was extracted (the banana plant has no trunk because it is not a tree; the appropriate term is pseudostem; the structure that*

supports the pseudostem is referred to here), and the combination of its edibility (chewing) with the fibre residues from chewing (natural organic matter) inspired me to think of the material as something that can be "broken down and used for repairs". Therefore, I designed a banana fibre–based repair glue to incite users to reflect on object regeneration on the basis of reusing the fibre.

(Quoting from participant's words)

4.3. Action Step 3: Material Pattern

After the steps of material understanding and preliminary material-tinkering categorisation were completed, the MDD experts introduced tools for the experiential characterisation of materials; specifically, tools for material-driven material selection (MDMS) [66] were used to collect quantitative data comprising four levels of experiential feedback, namely, sensorial, interpretive, affective, and performative feedback. Thus, the users conducted a material perception evaluation on the basis of relativity (e.g., qualities of smoothness and roughness) within the frame of five designated scales of values. For example, Figure 7 presents the MDD tool kit for the sensorial level in the experiential characterisation of the materials examined in the present study. The material perception evaluation was conducted through interviews with the participants to understand their perceptions and feelings regarding the banana-fibre material (including their visual, tactile, and emotional perception).

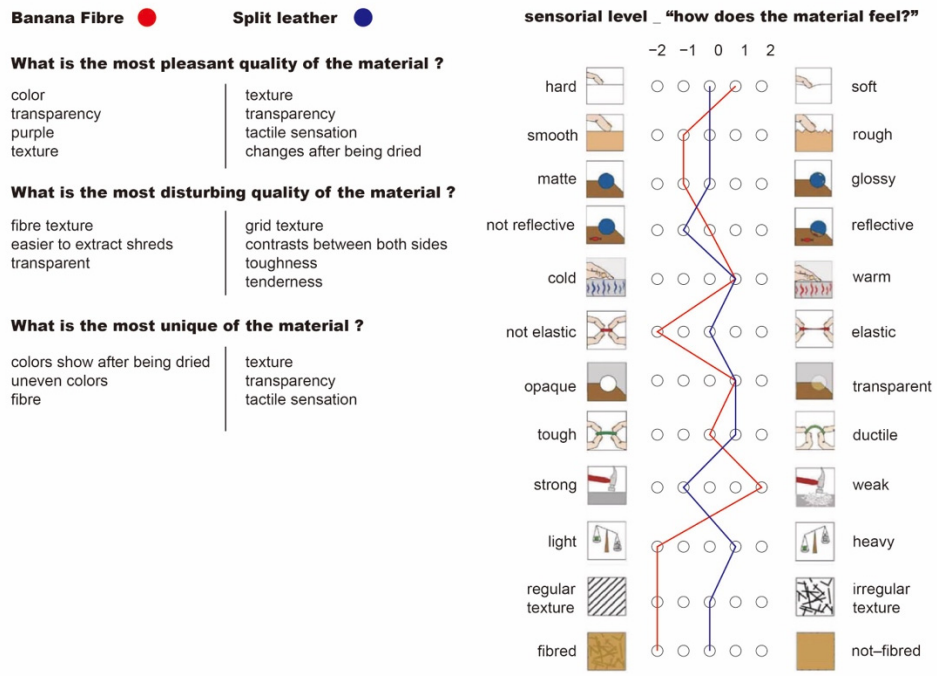
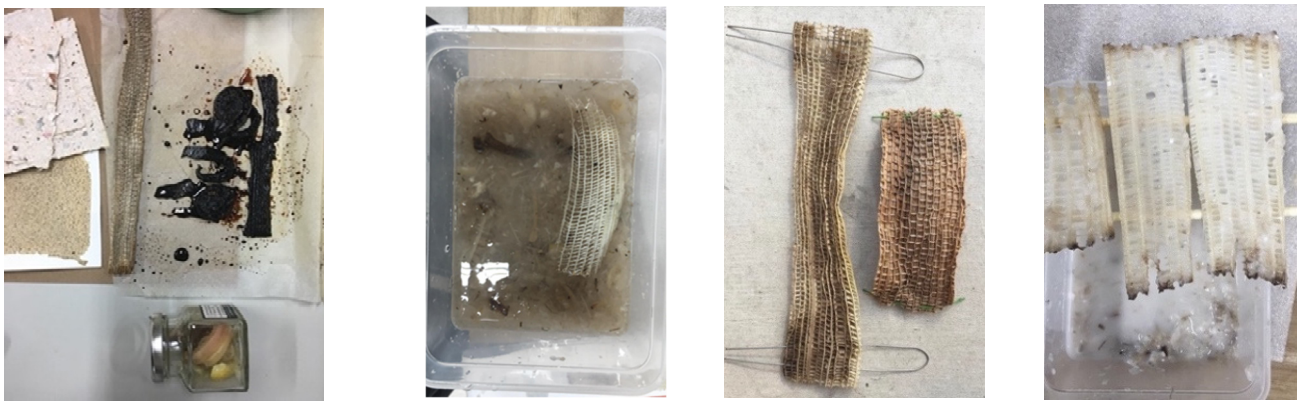


Figure 7. Tool kit for the sensorial level in the experiential characterisation of materials (re-illustrated in accordance with the data provided by Chen Kuan Cheng (a participant).

4.4. Action Step 4: Material-Tinkering Loop

Action Step 4 of the MDD method is regarded as a recyclable loop. Specifically, the material tinkering performed in Action Step 1 served as the loop in the design prototyping practice and experimental flow in Action Step 4, and it gradually formed a systematic structure involving design thinking for design practice cases through continual experimentation, manufacturing, and modification processes involving the sample material. The role of participants in material tinkering is that of a chef; they have to evaluate the materials that are available and consider their options for cooking the "ingredients" that they have, which vary depending on their familiarity with the materials and tools or their individual specialty. Experimental material tinkering was the starting point for entering the loop. Due to the

large sample size of the present study, only specific representative samples are presented. The experimental case samples are presented in Figure 8. CH, a participant who specialises in fibre crafts, experimented on basic food-processing techniques for treating composite materials, which included candying, salting, and caramelisation. Figure 8a shows the candied and heated caramelised samples. The material thinking of DD, a participant who was an industrial designer, accentuates the functional aspect through reinforcing of the fibre structure with metallic fibre (Figure 8b). CF, a participant who was a woodworker, experimented with pulp blending and the addition of natural resin glue by applying the concepts of material compounding, water absorption, and for maintenance of the material's natural grid structure (Figure 8c,d). After presenting their sample materials through preliminary experimental tinkering, all the participants were guided on the operation of material re-tinkering by the experts.



(**a**) (**b**) (**c**) (**d**)

Figure 8. (**a**) Caramelised samples (made by CH); (**b**) structural reinforcement with metallic fibre (performed by DD); (**c**) pulp blending (performed by CF); (**d**) resin-glue application (performed by CF). (courtesy of NCTRI).

The observations and summary at this phase revealed that, because the material used in the present experiment was drawn from the banana stem (the form of which is a complete plant stem), the participants generally focused on deconstructing and recombining banana fibre using the following techniques: (1) adding—beeswax, gelatine, white glue, epoxy resin, pulp, clay, and metallic fibre were added to endow banana fibre with water resistance and to reinforce its structuredness; (2) drying—hot pressing, baking, or natural sun-drying were performed to reinforce the fibre structure and enhance its resilience; (3) smashing—aggressive and comprehensive damage was dealt to the banana-fibre material through the use of choppers or high-speed mixers, and the material is then blended with heterogenous materials for recombination and formation, thereby expanding the plastic-related applications of the product.

Material-tinkering development varied among participants. To allow the participants to appreciate each other's works and engage in mutual exchange, an evaluation of semi-developed material was conducted for the fully tinkered sample materials in the form of periodic presentations (Figures 9 and 10). The two MDD experts—a senior NTCRI researcher and the first author of the present study—also participated in the evaluation and provided the participants with suggestions and feedback before vision-based design prototyping was performed; this encouraged them to reflect on the breakthroughs that were achieved in terms of design concept and prototype development [67].

Figure 9. Receiving suggestions and feedback for the sample materials (the lady holding a microphone on the left is Dr. Elvin, one of the MDD experts; the gentleman holding a camera is the senior NTCRI researcher Dr. Yau; the others are participants of the workshop). (photographed by 1st author).

Figure 10. Products of sample material tinkering. (photographed by 1st author).

Finally, the 19 design concept prototypes that were completed in this phase were preliminarily divided into three categories, namely, lampshades (six pieces), daily necessities (five pieces), and accessories and artistic creations (eight pieces). On the basis of the taxonomy and the three categories of material-tinkering techniques, six cases of work were selected and presented (Table 1). The material-tinkering techniques included: material shaping and drying using moulds; an orientation towards the concept of fibre paper making was realised by smashing the material and experimenting with the addition of pulp, paste, and agar to allow for the broken starchy material to be shaped through gluing during the drying process; reinforcing the material structure by weaving metallic fibres into the grid interstices of the banana fibres; adding fibre to handmade soap to create bath balls as an alternative product; adding fibre to clay by applying concepts such as pottery firing.

Table 1. Six cases of work selected during Phase I (Appendix A presents a comparison table of participant codes, and Appendix B provides a summary of the 19 works).

Category of Design Concept	Code	Sample Material	Design Prototype Development Brief	Material-Tinkering Techniques
Lampshade	DA		The possibility of 3D banana-fibre formation: designer Kuan-Cheng Chen made use of the shrink ability of dried-banana thread fibre and fitted banana threads into moulds for sun drying/baking, thereby allowing the fibres to be shaped in accordance with the shapes of the moulds.	Moulding and drying
	CF		Use of discarded banana stems: woodworker Jing-Teng Lin began by thinking about bark from which no thread could be drawn. Lin then re-deconstructed various banana-tree compositions (including waste banana skin and discarded structures that were not used to draw threads), which were subsequently used to develop fibre paper.	Smashing and adding (pulp)
Daily necessities	DF		Natural fibre: by compounding composite materials, designer Chung-Han Lu developed material applications based on the concept of repair.	Smashing and adding (paste and agar)
	CB		Banana-silk fibre and soap: craftsperson Ching-Yi Chou sun-dried the thick fibre in a banana stem and used it to produce cleaning tools or added it into handmade soap. The tissue of used fibre can be reused, and it degrades naturally.	Drying and adding (handmade soap liquid)
Accessories and artistic creations	DD		Banana-silk soft plastic lampshade: designer Benson Liu sliced away entire banana-leaf sheaths and removed the outer skin, retained the grid structure at the centre of the banana stem, and then performed interlaced weaving with metallic fibres.	Drying and adding (composite weaving)
	DI		Land and roots: designer Ching-En Yeh utilised the materials and method of pottery firing and fired banana threads combined with Taiwanese endemic materials into bricks.	Adding (black soil and sand) and firing

5. Grounded Theory Analysis

5.1. Evaluation Standard and Method

The grounded literature review was based on two studies that examined the banana-fibre weaving techniques of the Kavalan tribe [68,69], and interviews were held with the advocates of banana-fibre weaving techniques of the Kavalan tribe community in Xinshe Village, Hualien (i.e., Ching-Ying Pan, the leader of the local banana-fibre-weaving workshop in the Kavalan community, and Shu-Yen Chen, a banana-fibre weaver who resides in the community). Qualitative grounded-theory coding was subsequently performed by referencing the narratives of the 20 participants of the banana-fibre workshop with respect to their personal self-observations and recorded operational behaviours. The grounded analysis aimed to summarise and validate sections in the literature detailing the experiences of the participants from the procedures of material analysis to the formation of design imagery and the establishment of the Kavalan community's expectations regarding banana-fibre crafting. The results serve as a reference and established prior knowledge for Phase III of the present study, that is, the design implementation phase. Grounded content was jointly analysed by the first author of the present study and two NTCRI researchers; one researcher had a background in weaving crafts, and the other was a researcher of this research project. The qualitative-research software Nvivo12 was used to compile the data obtained from Study 1, which included information on the history, culture, materials, and craft techniques pertaining to the workshop and its evolution.

5.2. Coding Results

A considerable amount of data on banana fibre was collected from online articles, design cases, and videos, and they overlapped with the recorded interview content; hence, only a part of the data was used for the grounded-theory analysis. Therefore, the present study only performed grounded coding using data that contained research evidence (Table 2). In total, 365 nodes, 15 open codes, and five axial codes were compiled, and the five axial codes were as follows: (1) problems and recognition, (2) value of banana fibre, (3) essence of banana-fibre material, (4) lifestyle applications, and (5) development of new design thinking (Tables 2 and 3). Subsequently, selective coding was performed for the axial code for which the largest number of coding results was obtained (i.e., new design thinking) and the axial code of interest to the present study (i.e., value of banana fibre). The output tree nodes for the axial code "new design thinking" were (1) user-oriented design, (2) material-processing-oriented design, (3) creative attempts to utilise the physical properties of the material, and (4) innovative applications for composite materials. For the axial code "value of banana fibre", the output tree nodes were (1) value of indigenous traditions, (2) cultural continuity and inheritance, and (3) naturalness and environmental friendliness. Tables 4 and 5 present a further analysis of the aforementioned tree nodes.

Table 2. Axial-coding results based on the relevant literature, interviews, and records of participant experiences.

Axial Code	Open Code	Node Amount	Example of Open Code
1. Problems and recognition	(1) Problems encountered in the development of traditional techniques	16	Example of Open Code (1) Simplifying procedures while obtaining the largest pieces of the material is crucial to the material selection process.
	(2) Recognition of innovative development	10	

Table 2. *Cont.*

Axial Code	Open Code	Node Amount	Example of Open Code
2. Value of banana fibre	(3) Value of indigenous traditions	18	Example of Open Code (5) Banana fibre is an essential weaving material for clothing and daily necessities in the Kavalan community. The material is sourced from an indigenous species; it is a native, natural, environmentally friendly, local, and traditional material for the community.
	(4) Cultural continuity and inheritance	31	
	(5) Naturalness and environmental friendliness	43	
3. Essence of banana-fibre material	(6) External (intuitive) image	11	Example of Open Code (8) The material is a smooth, flaky fibre with low cohesion (i.e., degree to which the fibre can be twisted and stuck together).
	(7) Material physical structure	9	
	(8) Performance of physical properties	11	
	(9) Similarities with other materials	2	
4. Lifestyle applications	(10) Textile and processed lifestyle products	11	Example of Open Code (10) In Kavalan tradition, banana fibre is woven into straw mats, nets, coats, and belts that are worn with their traditional hemp clothing.
	(11) Dietary consumption	5	
5. Development of new design thinking	(12) User-oriented design	4	Example of Open Code (13) Traditionally, the discarded section of the banana split, specifically the stem, is used as a crucial material for non-weaving purposes.
	(13) Material-processing–oriented design	85	
	(14) Creative attempts to use physical properties of material	39	
	(15) Innovative applications for composite materials	70	
Total 5	15	365	

Table 3. Analysis of node distribution in each axial code.

Axial Code	Research Participants (Craftspeople)	Research Participants (Designer)	Stakeholder Interview	Literature Data	Total Percentage
1. Problems and recognition	5.38%	2.82%	14.29%	33.33%	7.31%
2. Value of banana fibre	22.31%	14.79%	67.35%	23.81%	25.73%
3. Essence of banana-fibre material	5.38%	16.2%	2.04%	9.52%	9.65%
4. Lifestyle applications	6.92%	3.52%	2.04%	4.76%	4.68%
5. Development of new design thinking	60%	62.68%	14.29%	28.57%	52.63%
Total	100%	100%	100%	100%	100%

Table 4. Analysis of node distribution in open codes for "development of new design thinking".

Open Codes	Research Participants (Craftspeople)	Research Participants (Designer)	Stakeholder Interview	Literature Data	Total Percentage
(1) User-oriented design	1.22%	3.16%	0%	0%	2.09%
(2) Material-processing-oriented design	43.9%	44.21%	57.14%	14.29%	43.46%
(3) Creative attempts to use physical properties of material	17.07%	18.95%	28.57%	14.29%	18.32%
(4) Innovative applications for composite materials	37.8%	33.68%	14.29%	71.43%	36.13%
Total	100%	100%	100%	100%	100%

Table 5. Analysis of node distribution in open codes for "value of banana fibre".

Open Code	Research Participants (Craftspeople)	Research Participants (Designer)	Stakeholder Interview	Literature Data	Total Percentage
(1) Value of indigenous traditions	9.28%	9.09%	36.36%	20%	19.57%
(2) Cultural continuity and inheritance	12.5%	27.27%	54.55%	60%	33.7%
(3) Naturalness and environmental friendliness	78.12%	63.64%	9.09%	20%	48.74%
Total	100%	100%	100%	100%	100%

5.3. Key Point Analysis

Table 3 presents the preliminary analysis results of the collected raw data through the use of axial coding. The columns compare the density levels of the nodes in the coded data. Among the participants in Phase I of the workshop, both craftspeople (60%) and designers (62.68%) expressed a considerable level of concern over the development of new design thinking. Additionally, the total percentage statistics also suggest that the axial code "development of new design thinking" was considered more important than the other axial codes (52.63%). The statistics also reveal that the local banana-fibre craftspeople (i.e., stakeholders) are highly concerned about the value of banana fibre (67.35%); the percentage of nodes that represented the "value of banana fibre" axial code (25.73%) in the interview record was less than only the percentage of nodes that represented the "development of new design thinking" axial code.

Accordingly, the axial codes "development of new design thinking" and "value of banana fibre" were adopted for selective coding. Tables 4 and 5 present the open coding-analysis results. The density of the nodes that represent "material-processing-oriented thinking" and "innovative applications for composite materials" among the responses of the craftspeople and designers were comparable. Additionally, craftspeople and designers were more concerned about "material-processing-oriented thinking" than "innovative applications for composite materials" (craftspeople, 43.9% > 37.8%; designers, 44.21% > 33.68%). The density of the nodes that represent "material-processing-oriented thinking" (43.46%) was also greater than those representing "innovative applications for composite materials" (36.13%). This indicates the crucial role of the individuals with "material-processing-oriented thinking" (both designers and craftspeople) in product manufacturing or design. Furthermore, the density levels of the axial nodes in the stakeholder interview and literature data were notably high or low. For example, 0% of the interview records and literature data consist of nodes associated with "user-oriented design". The interviewees received professional training, which centred on the inheritance and presentation of weaving skills, but their interviews did not reveal any narratives associated with "user-oriented design". Similarly, the literature data detailed the contextual background of Kavalan culture, knowledge on the banana-fibre-weaving craft, and the innovative development of cultural industries, but they did not cover "user-oriented design". Therefore, the density of the nodes in the interview records suggest a high degree of concern about "material-processing-oriented design" (57.14%); the density of the nodes in the literature data were concentrated around the theme of "innovative applications for composite materials"; this is because the literature data has explored industrial innovations for developing crafting culture (71.43%).

To explore how banana fibre is used as a crafting material by indigenous people, the present study used selective coding to analyse the density of nodes representing the "value of banana fibre" (Table 5). According to the statistics, the nodes were clustered in two regions. Craftspeople (78.12%) and designers (62.64%) examined in the present study regarded the "value of banana fibre" code to be within the "naturalness and environmental friendliness" dimension; by contrast, the participants from the interview records (54.55%) and literature data (60%) expressed a high degree of concern about the cultural continuity and inheritance dimension.

6. Applying Material Exploration Samples in Design Implementation

The present study proposed a design template to devise applications for banana fibre within a three-month period. The template expands upon the concept model in Phase I and the grounded-analysis results obtained during Phase II. Three participants from Phase I (i.e., two designers and one craftsman) were invited to evaluate the practical extensiveness and feasibility of the devised design practice; they were invited because of their willingness to continue participating in the present study. As a designer, Kuan-Cheng Chen has long-accumulated interdisciplinary development experience in the crafts and design industry. Chen's contributions to and participation in the design process provided a meaningful reference for the present study. The other designer, Chung-Han Lu, has continually participated in the present research project (i.e., self-manufactured crafting material project) and has extensive experience in applying MDD in material exploration. The two designers referenced the material-tinkering method used in Phase I (i.e., use of shredded materials), which was similar to the method applied by the woodworker Jing-Teng Lin. Additionally, to overcome the limitations of traditional crafting techniques and design-thinking frameworks, the present study recruited a student (coded as "SA") from a master's design program to apply her basic design training and basic research literacy. The participation of SA served to provide the perspective of an individual whose design thinking has yet to stagnate during the design-implementation process.

In this phase, the researcher guided the participants in reviewing key points of the literature on MDD, and they gave each of the participants, as a reference, a copy of The New Fiber World-Taiwan Local Material Exploration and Creative Experience, a book in which the results of Phase I (i.e., workshop) were published [70]. Additionally, prior knowledge that was constructed based on grounded-theory analysis was provided to the participants to increase their support of the use of banana-fibre materials. The results observed in Phase I indicate that the participants were generally interested in reusing the discarded banana stem after fibre extraction. The interest of the participants was particularly apparent when they were discussing the possibilities of innovating traditional crafting techniques. Notably, the participants maintained that, because the banana fibre is an all-natural material, the opportunities to reuse waste materials resulting from traditional crafting methods are particularly meaningful. Furthermore, the results of the grounded-theory analysis in Phase II indicated that the open code "material-processing-oriented thinking" of the axial code "development of new design thinking" was highly focused on the literature data. These results reveal that the vision of the participants regarding the development of banana-fibre materials was mainly focused on how they could further process usable materials and how they could apply material tinkering to overcome the difficulties encountered during the commercialisation of products made using the banana-fibre material. Accordingly, the time allocated for the participants to understand the basic characteristics of banana-fibre materials was reduced, thereby enabling the participants to quickly and systematically shift their focus to the material-tinkering loop.

6.1. Design Implementation of Material Exploration

In this phase, the evolution of the design process of three experimental cases was explored.

6.1.1. Case 1: Using Drying Shrinkage Characteristics of Banana Fibre for Design Shaping

This experiment was performed by the designer Kuan-Cheng Chen, who participated in Phase I of the present study, during which the drying shrinkage characteristics of banana fibre were explored. Banana fibre was fit into a mould and subjected to sun-drying or baking to form the desired shape (Figure 11). During this phase, the shapes and design of the material and mould can be further adjusted.

Figure 11. The 3D shaping of banana fibre material. (courtesy of NCTRI).

Due to the designer's concept product in Phase I was similar to the shape of the complete product, the design vision of the new material had been successfully extended in Phase I. Additionally, on the basis of previous experience, the focus of material tinkering was placed on overcoming the dependence of dry material on the mould. By adjusting the mould processing process and referencing how the previous participant of the experiment (coded as "CE") applied fibre weaving in material tinkering (Figure 12), the designer adjusted the design concept model that was established during this phase (Figure 13). (courtesy of NCTRI)

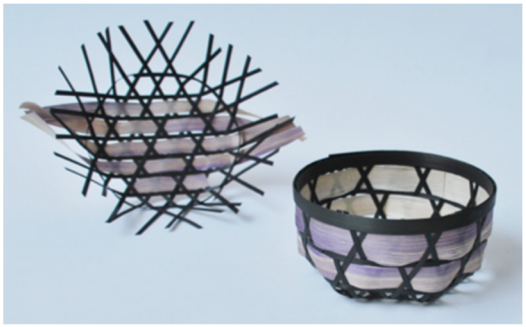


Figure 12. Material tinkering by participant CE in Phase I. (courtesy of NCTRI).

(**a**) (**b**)

Figure 13. Design model proposed by Kuan-Cheng Chen in Phase III. (**a**) The 3D model concept; (**b**) physical prototype. (courtesy of Kuan-Cheng Chen).

The design that was developed in this case is relatively conservative compared with that of the other two experimental cases. The application of composite material in weaving

has been explored in the modern field of crafting. For example, for the 2011 Taiwan–France Hand in Hand project launched by the NCTRI, designer Patricio Sarmiento used a composite material consisting of bamboo strips and leather to create a novel bamboo-weaving craft design (Figure 14). The use of banana stem in this design emphasised the light transmittance of the material. Furthermore, Sarmiento's professional background in digital design enabled him to adopt parameter design to create a framework for the lamp to transcend the limitations of traditional weaving crafts.

Figure 14. Taiwan–France Hand in Hand project, Gua_Dual, designed by Patricio Sarmiento; manufactured by Lin Jiang Cheng (bamboo) and the Sobdeal company (leather) (left to right: weaving bamboo with leather material samples; sample prototypes; developing the prototype with Taiwan's indigenous totem). (courtesy of NCTRI).

6.1.2. Case 2: Applying Material Shredding and Mixing in the Design of Disposable Tableware

In Phase I, the designer Chung-Han Lu and the woodworker Jing-Teng Lin collaborated to implement the shredding-and-mixing design method for material tinkering (Figures 15 and 16). The actual implementation of the design was conducted separately by each designer. First, Lu processed the shredded banana-fibre material into a quantified scale and form for material tinkering and revised the model prototype design to establish a more realistic scale for future mass production. Subsequently, Lin, who specialises in fine woodworking, applied a woodturning technique to create the wooden mould required for design development, thereby ensuring the completeness of the prototype design concept (Figure 17). The researcher held two discussions with the participant in each case. During this phase, pulp was not added to the banana-fibre material. Instead, the participants referenced the "tinkering" concept applied by designers and used short banana fibres to replace the function of pulp fibre. The recomposite material, which was created using shredded banana fibre, was used to tinker and replace waterproof sections. Therefore, a waterproof coating that consisted of beeswax and isinglass was applied to the surface of the material to achieve the set functions required in disposable utensils that use the new material.

Figure 15. Evolution of the material-tinkering experiment using shredded materials and the prototype of design concept by designer Chung-Han Lu in Phase I. (courtesy of NCTRI).

Figure 16. Evolution of the material-tinkering experiment conducted using shredded materials mixed with pulp and the prototype of design concept by craftsman Jing-Teng Lin (left to right: shredding, fibre extraction, reduction in fibre length, mixing with pulp, papermaking using banana fibre mixed with pulp, and papermaking mould for banana fibre mixed with pulp). (photographed by 1st author).

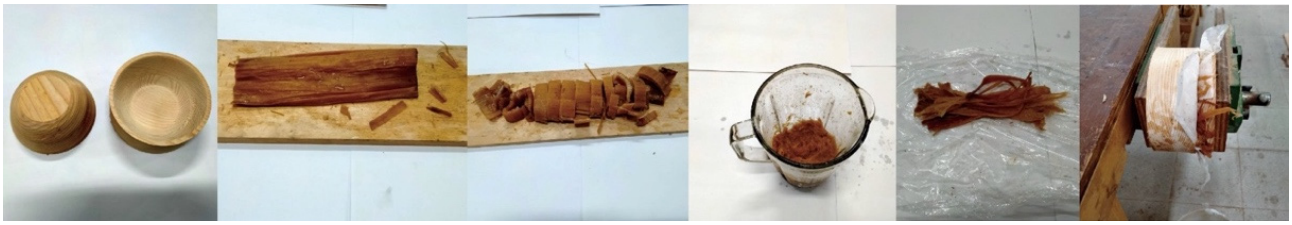


Figure 17. Material-tinkering process (left to right: wooden mould, fibre soaking, chopping of fibre, grinding of fibre, extracting of long fibre, and mixing and water-pressing of long and short fibres). (photographed by 1st author).

Mould processing is a common practice among craftspeople and designers. Through the proposed design implementation framework, both participants quickly reached a consensus regarding the shape of the mould to use. Throughout the process, the participants repeatedly tested various proportions of long and short fibres in creating the optimal material structure after completing the water-pressing process (Figure 18).

Figure 18. Design model proposed by Chung-Han Lu and Jing-Teng Lin in Phase III. (courtesy of NCTRI).

6.1.3. Case 3: Continued Application of Creative Composite Material Design

The design student SA reviewed prior knowledge and referenced how CA and DB tinkered the dried banana-stem material. CA used iron wires and wooden boards for plate fixation to thoroughly spread the material and prevent wrinkles caused by the loss of moisture during the fibre drying process (Figure 19). By contrast, to retain the original material structure, DB used adhesive coating (e.g., white glue, epoxy, and super glue) to prevent the material from turning yellow and shrinking as a result of oxidisation (Figure 20). Accordingly, the design vision set by SA for the new material was to process banana stems into quantifiable processing materials and to devise the optimal processing method for material drying. Figure 21 compares SA's records for samples dried using various fixation methods, namely, needle, plate, and fixture fixation. The records reveal that the combination

of the plate fixation with the use of threads effectively produced the optimal material output. Additionally, the material retained optimal quality after thread removal.

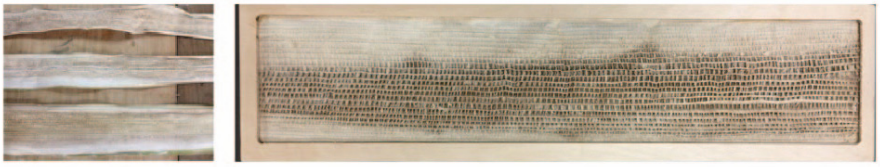


Figure 19. Plate fixation using iron wires (**left**) and wooden boards (**right**). (courtesy of NCTRI).

Figure 20. Dried topography of various adhesive coating surfaces. (courtesy of NCTRI).

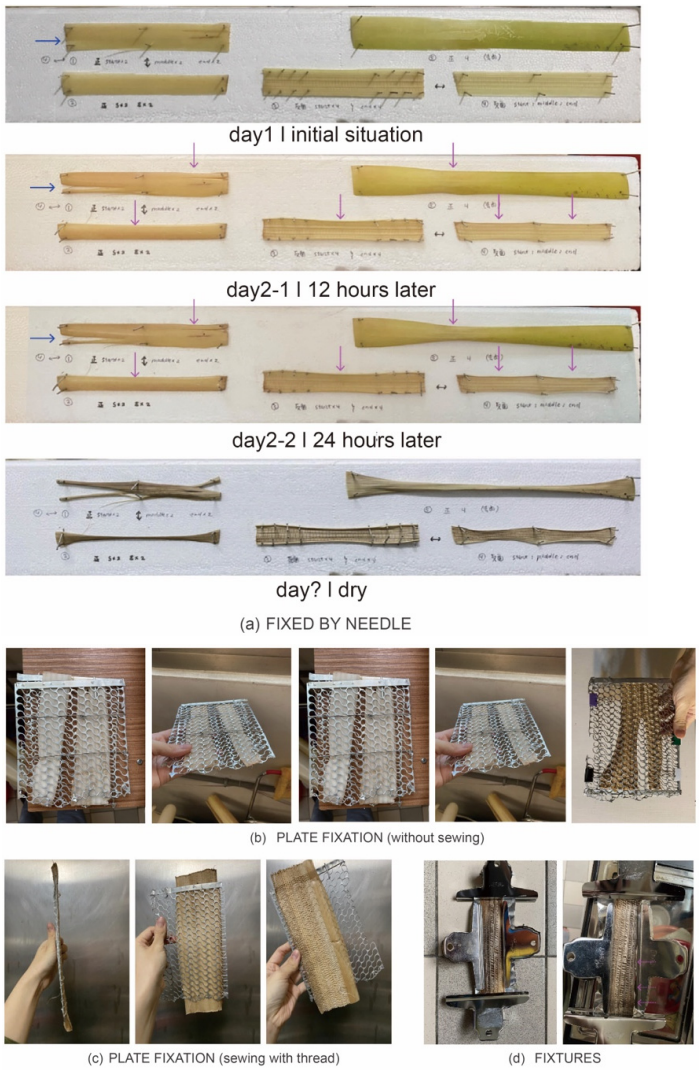


Figure 21. Comparison of plate fixations using needles (**a**), plates (**b**,**c**), and fixtures (**d**). (courtesy of NCTRI).

SA's design records indicate that the visual experience presented by the texture of the plant material was incorporated into the design concept. For example, the image of hands of bananas was extended into the fibre pattern of the product. SA applied the tinkered material to the design prototype to ascertain the necessary design adjustments required for the design or material (Figure 22). However, because of time constraints, the design implementation of the present study only resulted in the creation of a sample of the design model using the final material with the wave-shaped pressing mould. The material was dried using a clamping plate, and the material surface was covered with a silicon coating (in accordance with the method applied by DB during the material-tinkering breakthrough stage) to retain transmittance of the material and enhance its waterproof properties (Figure 23).

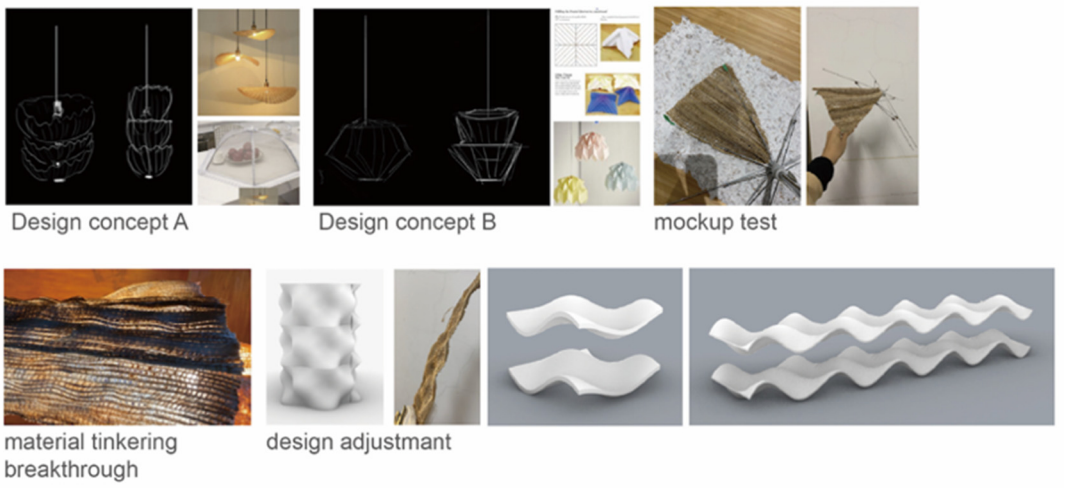


Figure 22. Key steps in the material tinkering loop. (courtesy of NCTRI).

Figure 23. Material presentation of the design concept proposed by SA. (photographed by 1st author).

The design developed in this case accounts for the inconsistencies in the scale of natural materials. After completing numerous sessions of material tinkering, the participant chose to use the wave-shaped pressing mould to mould the material surface. By using the parameter design function of Grasshopper 3D, the mould could be quickly adjusted using the parameters of the processing material, thereby overcoming the limitations of using natural materials for production.

6.2. Applying Material Exploration to Generate Sustainable Benefits

To explain the new knowledge obtained from the design's implementation and research, the present study first detailed the set development vision for material exploration without any preconceived conditions. The key focus points related to design, technology, and applications were established on the basis of the designs, observations, and records of the participants with respect to the material-tinkering process and the discussions between the researcher and participants. Figure 24 describes the procedures of Case 3 and provides detailed notes for comparison with the grounded-theory analysis results. Through this process, a new development vision for the material was formed. For example, the fixation method used for material drying in Case 3 was crucial; the material must maintain its integrity after drying, and the wrinkles caused by drying must be minimised. Additionally, the core problem of the present study is how banana fibre, an indigenous crafting material with cultural meaning, could be applied in design to create a continuous, systematic, cumulative, or evolutionary creative effect. Notably, every design project must derive a new design vision for the material on the basis of the previous model. Future studies should explore other material-tinkering methods or the evolution of material-tinkering design.

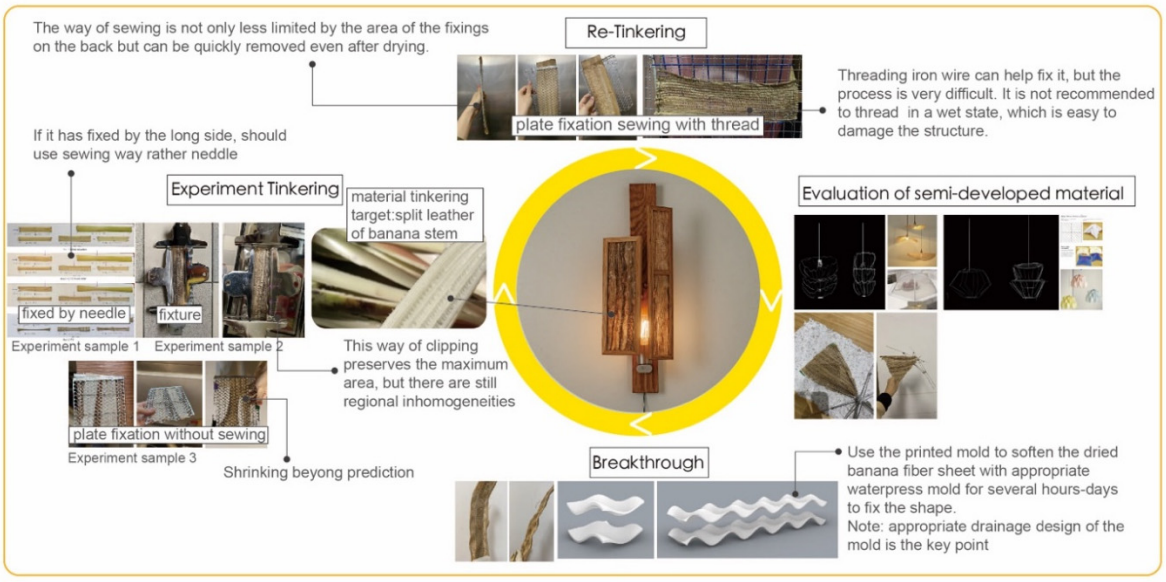


Figure 24. Annotations concerning the material-tinkering loop.

Figure 24 provides annotations based on the axial codes of the grounded-theory analysis. The prototype index highlights crucial problems that were encountered when the banana-fibre material was applied in sustainable product design. Several annotations were simultaneously expressed in the experiences reported in the other cases. These problems carried a specific meaning in the discussion of the design implementation for each case. For example, the use of moulds was considered to be related to the quantisation and productization of materials in accordance with the design implementation framework. Additionally, material processing (i.e., drying) was the main challenge for natural materials. Material drying was involved in all cases, although each participant developed their own design by applying their own drying method. Therefore, the material drying method is a crucial aspect in the sustainable design of natural-fibre materials.

The expression of concepts related to the prototype for design implementation and flexibility is essential for such underdeveloped design experiments that are based on natural materials. Relative to synthesised materials, natural materials are less stable, resulting in unanticipated conditions occurring during the experiment due to the use of different parts of such materials and the methods through which they were extracted. Therefore, creating a prototype sample is a highly challenging task for designers, particularly when the design

enters the market, at which point the natural materials that are used are evaluated on the basis of consumer understanding and acknowledgement.

Communication is crucial in the design field. Regardless of whether the participant has a prior background in material exploration or in material tinkering, records of material-tinkering examples (Figure 13) can provide participants with crucial material-tinkering information or ideas for innovative breakthroughs in the material-tinkering loop, thus expanding design options and opportunities. Similarly, to how designers play the role of a chef in the material-tinkering process, the aforementioned records play the role of a recipe and serve as a crucial communication medium for various participants.

7. Conclusions and Discussion: Continued Use of the Design Implementation Method

The present study explored how banana fibre can be transformed from a crafting material used among indigenous communities into a cultural asset for the contemporary era as well as a sustainable crafting material that can be created using agricultural waste. At the present moment, given their knowledge gap compared with the craftspeople, designers cannot systematically understand and process the material; hence, they miss an opportunity to convert banana fibre into a sustainable crafting material for modern products. The present study attempted to address this by introducing MDD to (i) help designers conduct material exploration, thus providing them access to local banana-fibre craftspeople (i.e., stakeholders) who can assist them in further understanding the material preparation process and application opportunities for the developed material (Appendix B); (ii) convey a specific image of the material for designers to think further by ground-theory analysis; and (iii) clarify the context of the design clues and assist designers in sorting out comparisons and references for their design practice process.

Ground on the MDD methodology, this study developed a material-tinkering loop to facilitate the realization of the fourth step (creating material / product concept) of MDD. For the specific case studies presented in this paper, designers practiced their design systematically with their own unique insightful observations, previous technical expertise, and digital assistance. The research results on MDD focused on the relationship and records of the materials used in the design processes and the experiences of users, whereas in RtD, annotated portfolios can serve as a knowledge medium for clarifying how search records are used in design to identify alternatives. Both the MDD and annotation portfolios conducted in this research can assist designers in developing new designs.

This research mainly focused on banana fibres and Taiwan's indigenous culture in studying the flow of material, which is the process of extracting banana fibre as a material, the inheritance of those techniques, and innovation from tradition. Thus, in this research, the issue of the flow of consciousness was less involved; the indigenous totem culture and the wisdom of applying daily necessities was not emphasised in the examined case studies. In future work, the research will attempt to go a step further in improving the treatment technologies of banana-fibre material-tinkering; it may help to enhance the consideration of mythological stories and the needs of local life in addition to including more local colours and cultural elements to strengthen the design derivation of traditional craft. Accordingly, these methods can support designers in determining the possible applications and potential purposes of these materials, thus enhancing the connection of designers with the development of specific materials and the attainment of a deeper understanding of the material.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Participant codes.

Category of Participants	Code								
The stakeholder of Kavalan Xinshe Village	BA (manager)					BB (nature fibre master craftsman)			
Craftsman	CA	CB	CC	CD	CE	CF	CG	CH	CI
Designer	DA	DB	DC	DD	DE	DF	DG	DH	DI
Non-Taiwanese industrial design student interns	FD (team of two)								

Appendix B

Table A2. A summary of the 19 works.

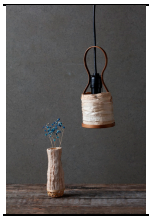
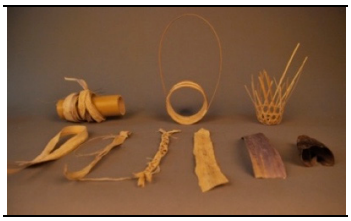
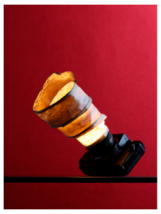
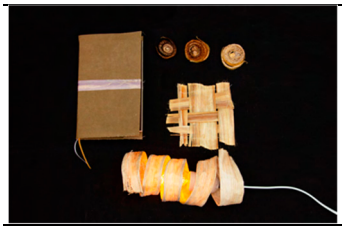
Category of Design Concept	Code	Prototype	Sample Material	Design Prototype Development Brief
Lampshade	DA			The possibility of 3D banana-fibre formation: designer Kuan-Cheng Chen made use of the shrink ability of dried banana thread fibre and fitted banana threads into moulds for sun-drying/baking, thereby allowing the fibres to be shaped in accordance with the shapes of the moulds.
	DB			3D structure of banana fibre: designer Cheng Yu Chung preserved the banana fibre's original colour and structure as well as its transmittance.
	CA			The network beyond weaving: craftsman Chiung Ju Chen used the stem, which is the leftover material from the traditional extraction method, as the main material and found ways to present its beauty.
	CI			Banana-fibre translucency test: craftsman Liang Ting Ye conducted an experiment on the transmittance of banana fibres and found new possible usages for this non-economically valued material.

Table A2. *Cont.*

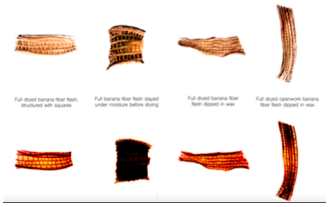
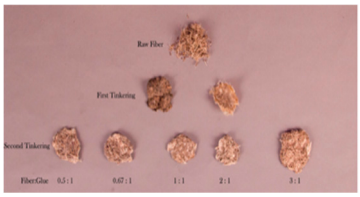
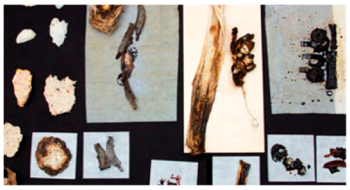
Category of Design Concept	Code	Prototype	Sample Material	Design Prototype Development Brief
Daily necessities	CF			Use of discarded banana stems: woodworker Jing-Teng Lin began by thinking about bark from which no thread could be drawn. Lin then re-deconstructed various banana-tree compositions (including waste banana skin and discarded structures that were not used to draw threads), which were subsequently used to develop fibre paper.
	FD			Flesh of banana trunk: designers Cordelia Faure and Dorian Etienne selected the waste part of banana fibres as conceptual in the presenting condition.
	DF			Natural fibre: by compounding composite materials, designer Chung-Han Lu developed material applications based on the concept of repair.
	CH			Combination of peel and banana silk: craftsman Ben Hui Wu aimed to discover the possibilities for banana trees, in addition to the bark fibres; the experiment also obtained the pulp of the bark layer, and sheets were acquired using different methods of cutting.
	CD			Accelerated fibre-spinning program: craftsman Jeffrey Lin attempted to weave dry banana fibre in the same way as bamboo chips and hoped that the natural fibre, similarly to banana silk, could be applied to the bee's wrap.
	CB			Banana silk fibre and soap: craftsperson Ching-Yi Chou sun dried the thick fibre in a banana stem and used it to produce cleaning tools or added it into handmade soap. The tissue of used fibre can be reused, and it degrades naturally.

Table A2. *Cont.*

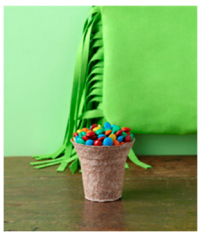
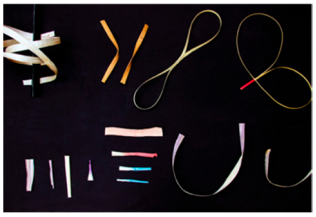
Category of Design Concept	Code	Prototype	Sample Material	Design Prototype Development Brief
Accessories and artistic creations	CG			Banana-silk buffer insulation: craftsman Wei Cheng Sung tried to produce a material to replace plastic that is disposable or a reusable insulating substitute.
	DG			How to eat banana fibre? Designer Hsin Ting She conducted tests with dried shell-flower fibre, yarn, and bark fibre.
	DD			Banana-silk soft plastic lampshade: designer Benson Liu sliced away entire banana-leaf sheaths and removed the outer skin, retained the grid structure at the centre of the banana stem, and then performed interlaced weaving with metallic fibres.
	CE			Combined with bamboo weaving: in the experiment by Ya Ching Lee, the fine bamboo battens were inserted into reticular fibres, which allows not only shoring up the original soft fibre sheet but also retention of the handmade texture.
	DE			The movement of banana fibre: designer Kai Ping Liu thought of banana fibre as a structural material and conducted a series of physical and chemical tests.
	CC			Alternative beauty of banana: craftsman Shang Lien Hsu tried to retain the quality of fibre and found that the combination of wire and banana silk would bring out a unique style due to their colour and brightness.

Table A2. *Cont.*

Category of Design Concept	Code	Prototype	Sample Material	Design Prototype Development Brief
	DH			Fish is dreaming: craftsman A. Wei Hsu learned the traditional Kavalan way of lengthening banana silk by tying one piece to another.
	DI			Land and roots: designer Ching-En Yeh utilised the materials and method of pottery firing and fired a combination of banana threads and Taiwanese endemic materials into bricks.
	DC			Reticular fibres: Designer Shin Hua Lin adopted the reticular layer left after the skin was shaved and tried to retain this reticular fibre by adding in other material that would result in maintenance of the banana silk's three-dimensional structure after dehydration.

Note: All the works are illustrated in the published book, The New Fiber World-Taiwan Local Material Exploration and Creative Experience.

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Inheritance of Traditional Family Values: A Comparative Study of Family Ancestral Shrines and Related Paintings of Lee Family

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Abstract: Apart from providing a haven, a home serves also as a place where people can develop their personalities and temperaments. Traditions within families are an often-unseen force that has a profound effect on people. In this article, the authors explore the meaning and value of family traditional inheritance in the current context and what manifestations may occur. After reviewing the history and characteristics of ancestral shrines, this study further examined the forms of expression used to express "home" and "family traditions" from the creator's perspective. A conceptual framework is provided for subsequent case studies. Considering the role and importance of different creations in the transmitting of family traditions, a family memorial hall named "Qiyun Residence" and a series of paintings called "Home: Sweet Home" were created by members of this family to analyze and interpret family traditions. The importance of family traditions cannot be overstated, but they must be appropriately expressed. It is our aim that the examples presented in this article show how "Traditional" can be transferred to "Modernity" for the sustainability of culture.

Keywords: ancestral shrines; family traditions; sustainability of culture; interior design; paintings

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1. Introduction

In the social sciences, family traditions have become a long-standing and frequently discussed topic. The process of internationalization is causing people to be influenced by diverse cultures. Nevertheless, the more this is the case, the more we should emphasize our traditional culture. Maintaining and transmitting culture is more than just a slogan, but needs to be implemented in daily life. A nation's traditional culture is considered an integral part of its cultural heritage. It is also true that the family has a significant impact on individuals. Cultural perpetuation may occur at the family level when tradition or spirits are transmitted from generation to generation. This may affect people's outlook on life and their values [1–5].

A home not only provides a safe haven, it also provides a place for a person to develop his or her personality and temperament. The attitudes of family members and traditions have a greater influence on the character and development of individuals. This kind of sustainable development at the spiritual level requires our attention. Depending on life experiences, outlooks on life and values, etc., people have different impressions of home and family traditions. Thus, it would be beneficial if we could build a more universal model that would not only help to better preserve "family traditions", but also serve as a reference for creation.

Two years ago, in Taishan District, New Taipei City, a family memorial hall named "Qiyun Residence" was built by members of the Lee family [6]. Generally speaking, the ancestral hall cannot be viewed the same way that it was in the past. Regardless of

whether they are part of the inheritance of traditional culture or the continuation of family traditions, the ancestral halls should be worth preserving. However, the form of expression used should be examined further. As such, the following two points summarize the two objectives of this paper:

1. An example of how "family traditions" can be highlighted is illustrated by the ins and outs of a completed family memorial.
2. For the reader's reference, this research aimed to construct some suggestions that can be used to plan and design a family memorial hall.

2. Literature Review

2.1. From "Ancestral Shrines" to "Family Memorial Hall": Their Role, Significance, and Inspiration

In Chinese society, ancestor worship has been widely recognized as one of the most significant cultural practices [7]. The ancestral hall of a family has significant meaning, as it represents the family's history, tradition, and culture, as well as its celebration of ancestors. Nadeau [8] argues that Chinese ancestor worship is known for its association with the ritual celebration of the deified ancestors and tutelary deities of people with the same surname who are organized into lineage societies in ancestral shrines. This is why people commemorate their ancestors on special occasions, such as the Qingming Festival. They also write genealogies or take other forms to transmit the spirit of their ancestors. Many families do not have a memorial area at home. This presents several challenges for designers since it is difficult to find suitable examples of this type of design.

In the past, some large families used to construct ancestral halls in or near their homes. They kept such ancestral halls as places where family members could memorialize their ancestors. During that period, ancestral halls were not only examples of art and architecture, but also a repository for cultural heritage (see Figure 1).

Figure 1. Lin Family Ancestral Shrine, East District, Taichung City.

With the renewal of the city, many of the old houses had to be demolished or rebuilt on their original sites. Some older houses or family gardens, due to their particular characteristics, have been designated as historical monuments. There may not be much space to live in the old house, but it is a memory of childhood for many individuals. Because of this, many people still return to their hometowns, even if they simply visit the places where their homes once stood.

It is true that, depending on the circumstances, not every family can afford to build an ancestral hall. However, the meaning of "home" may be both profound and subtle

for people and may not be easy to describe in words. People often place photographs of deceased family members on their desks or in their wallets or they hang photos of deceased relatives in their homes. Based on this study, ancestral halls and photographs are merely different in form, but they carry the same connotations. Hence, it illustrates that the cherishing of family affection will not be diminished due to inadequate material conditions, but rather due to a sense of spirituality.

As described previously, there are many types of memorialization that are usually combined with limitations imposed by objective conditions. Consequently, the planning and design of a memorial hall are very different from what we are accustomed to. However, given the importance and value of the "spiritual level" of the family memorial hall, which is interpreted through Maslow's Hierarchy of Needs [9], the "spiritual level" of the hall becomes more critical.

2.2. Transfer of "Tradition" to "Modernity": The Relationship between Form and Ritual and the Patterns of Its Application

Culture has been described as "the way of life of an entire society" [10,11]. Typically, it refers to models of human activity, which provide meaning to human activity. Different cultures have different approaches to interpreting or evaluating human behavior. In the field of linguistics, anthropology, and sociology, culture is defined as the outcome of human civilization's evolutionary process, a process that involves language, customs, religion, the arts, thought, and behavior [12].

To create high-quality living environments, creative professionals must be able to grasp the pulse of current society and use it as a guide when designing. They must ultimately reflect this ethos in specific design solutions. A few examples of the relation between form and ritual in creativity can be illustrated as follows: We go to the museum to see an object from hundreds of years ago and we are influenced by this object, not necessarily because of its form, but more importantly, because of the cultural connotations it carries. In this project, we attempted to interpret the culture and traditions of the time in a new way in order to design something that is compatible with modern aesthetic tastes and user habits (see Figure 2).

Figure 2. From *Ding* (prehistoric and ancient Chinese cauldrons) to modern cookware. On the top left is *Mao Kung Ding*, collected by the National Palace Museum. Other cookware is designed and manufactured by JIA.

Similarly, ancestral shrines or family memory halls can be viewed in the same light. In order to be concise, it would not be feasible for most families to designate a space for an ancestral hall. Young people may not readily be attracted to a form such as an ancestral hall. Hence, this is one of the objectives of this study, namely to provide a new lease on life to these traditional ancestral halls through a modern, plain, formal idiom.

2.3. Dissemination and Cognition of Artistic Creation

Through the application of creative thinking, traditional culture and rituals have been transformed into objects that meet the needs of modern society. Communication theory may be useful in explaining: (1) how these objects can arouse the interest of users; (2) how to effectively communicate the intentions of the creator; and (3) how to complete the cultural inheritance process.

Artists' creativity is often described as a manifestation of their pursuit of beauty, characterized by a complementary process through which connotations are experienced through form; the connotations enrich the form [13]. Form (style) and connotation (concept) complement one another in the process of artistic creation. The question is, how does this relationship between connotation and form result in a creative visual concept? Form and connotation seem to be in close correspondence, so within the form, there seems to be some evidence of connotation. In the view of artistic production as a form of symbol transmission, an artist encodes into his work a particular message that is later decoded by the audience [14–16]. Investigating artistic creation from the perspective of audience decoding helps us better understand the artist's creative process [17–19]. The levels of artistic creativity can be described as denotation and connotation [20,21]. It has been found that when it comes to successful communication between the artist (sender) and the viewer (receiver), certain requirements must be met on three levels [20].

In the past, most research on artistic creativity focused mainly on the artist and paid little attention to the viewer, yet the viewer plays a significant role throughout the creative process. The source of this article may be viewed as a compilation of life experiences, which is then finalized by being recognized by a majority of individuals. For this reason, whether it is design or artistic creation, creators should consider whether their works can forward information from the viewpoint of users or viewers during the process of conception.

3. Methodology

3.1. From "Culture" to "Cultural Creativity" Derivatives: A Conceptual Framework

Irrespective of whether it is a family memorial or an illustration of the daily life of a family, this study considers them to be "cultural products". Cultures and traditions can appear in a form that meets the aesthetics and needs of individuals, and they play an important role in the process of cultural inheritance and the continuation of family traditions.

To develop cultural products, one must rethink or revise cultural characteristics and then redefine them to create a new product that can integrate into society and satisfy the cultural and aesthetic needs of consumers [10]. Incorporating cultural characteristics into products contributes not only to the economic growth of a society, but also promotes and preserves the culture of the region. The transfer of cultural characteristics to products will be of great benefit to improving the cultural connotation of products. Based on the combination of cultural levels, layers, and design features, as depicted in Figure 3, a framework is developed to assist in the understanding of the design of cultural products or other forms of artistic creation [22]. In the process of practical conception, four steps are used to design a cultural product, namely, investigation (setting a scenario), interaction (telling a story), development (writing a script), and implementation (finishing a work). The researchers also asked people who had visited the "Qiyun Residence" to provide their impressions. The collation and analysis of this feedback from family members and visitors further allows us to conduct a more comprehensive analysis.

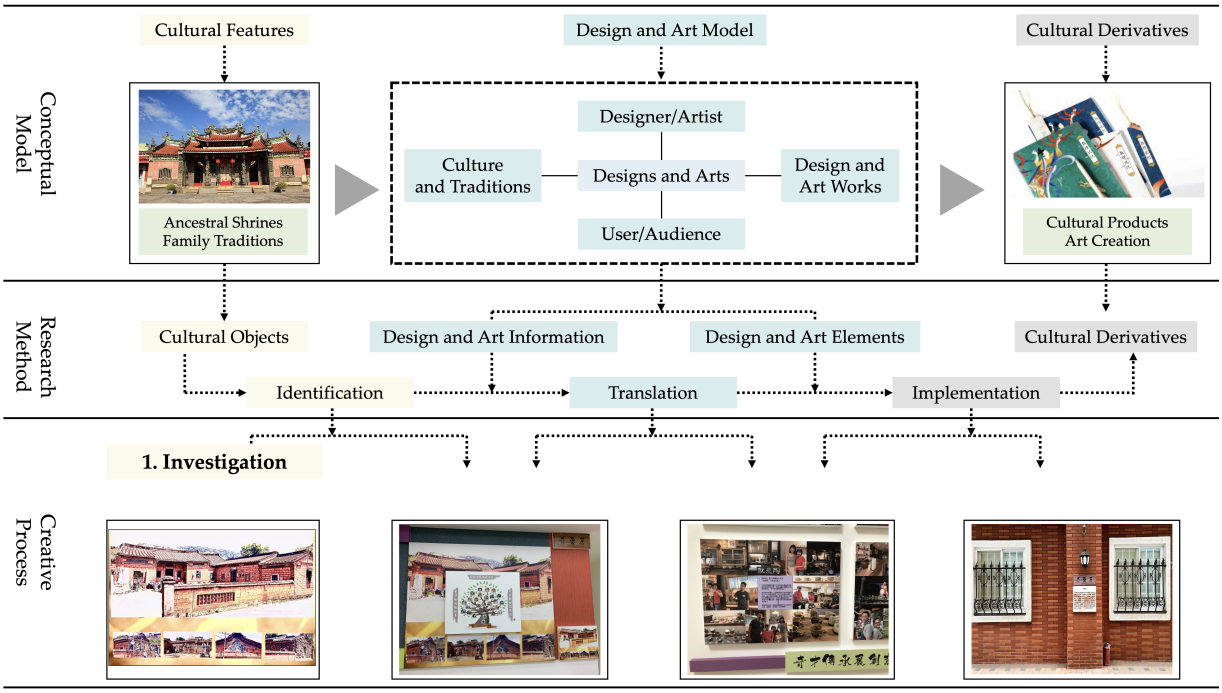


Figure 3. A conceptual framework of cultural product design. (Source: adapted from [12]).

3.2. Overviews of the "Qiyun Residence"

Most ancestral halls that are still in existence have been constructed relatively early in history and have been correctly protected by being designated as historical monuments. As well as that, some ancestral halls or family mansions are also available to visitors after they have been approved. Thus, these efforts have been of great assistance in preserving and sustaining the culture as a whole. However, even if most people wish to create similar spaces for their families, they may encounter many difficulties. Firstly, there is not necessarily enough space; secondly, what kind of planning should be undertaken? Finally, what is the best way to utilize such a space? Aside from that, it will be a formality and will not serve the goal of sustainable development of culture and family traditions.

In light of the aforementioned factors and the study's objectives, we selected an already completed family memorial as a case study to explore the process of designing it in depth. Meanwhile, we discuss the importance of various forms of artistic expression in passing down cultural traditions through the artwork created by a member of the family.

In addition to the completion of "Qiyun Residence" by the end of 2020, we conducted pilot research surrounding it, primarily to explore the design process [23]. In this study, some of what was previously completed is moderately cited.

Furthermore, some of the images in this article were taken by a member of the Lee family. Importantly, the research team was able to gather first-hand information about the case thanks to the permission of the owners of "Qiyun Residence". As a result, the study can be analyzed objectively and comprehensively.

4. Results: Case Analysis and Discussions

4.1. The Interweaving of "Memory" and "Recollection": Lee Family's Ancestral Shrines Named "Qiyun Residence"

With the development of society, people's incomes have continued to rise, and the quality of life has improved significantly. With the advent of human-centered design, the concept of object-oriented design has evolved and become a concept that concentrates on the "desires" of consumers [24]. Consumers also seek to assert themselves on a psychological level, in addition to satisfying their physiological needs. Under these economic conditions, it is not uncommon for "desires" to exceed "needs", which is also indicative of the future

development of the design. Conceptually, "Qiyun Residence" begins on the level of spiritual needs and exercises its value.

There is a memorial hall named "Qiyun Residence" (see Figure 4) built by the Lee family to commemorate the deceased parents and it has been built on the original site of the Lee family's old residence (see Figure 5). To name the memorial hall, they combined a Chinese character from their father's and mother's names. The idea for this memorial originated from the family's eldest son and his wife. There were other family members involved in the design and planning of the memorial. Having worked together as a team, the memorial hall was completed on schedule (see Figure 6).

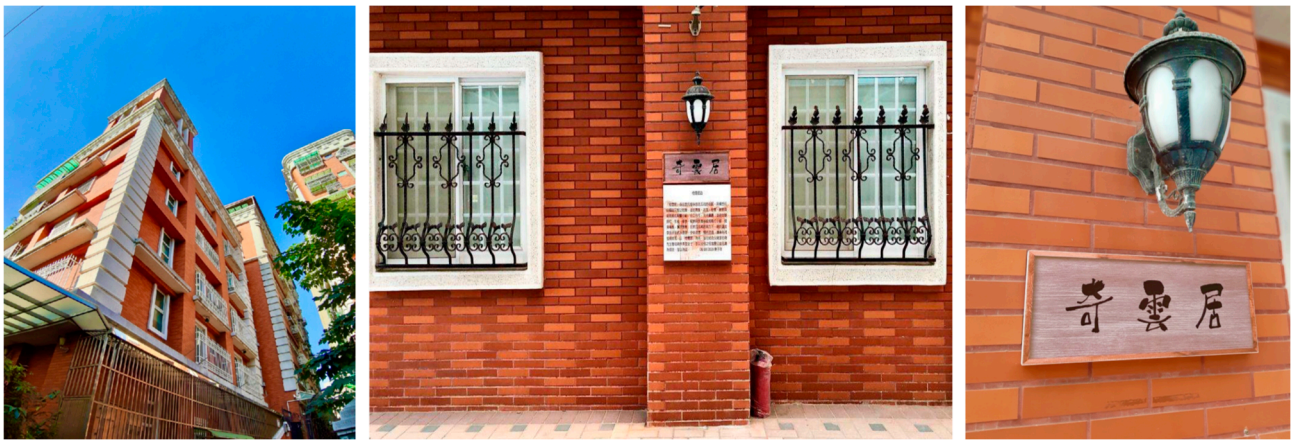


Figure 4. The façade and plaque of the "Qiyun Residence", Taishan District, New Taipei City. The Lee family continues to cherish the memories of the past in this memorial.

Figure 5. The ancestral house of the Lee family. The old house is still on the original site, and although it does not play a residential role, it is a link between the members of the Lee family. For the Lee family, this ancestral house is full of memories.

Figure 6. Inauguration and unveiling ceremony of "Qiyun Residence", 20 December 2020.

The family memorial hall is not commonly found. Evidently, if one plans and designs in accordance with the style of the ancestral hall as it existed in the past, one is not taking into account the aesthetics and functional needs of today. Furthermore, the study suggests that more effectively integrating the concept of a people-oriented memorial into the planning and design of a family memorial is one of the keys to its success. This study further encapsulates the basic design concept of "Qiyun Residence" in the following three aspects:

- In its overall design, "Qiyun Residence" opted for a modern and minimalist aesthetic. Meanwhile, the decoration of the space features details, such as a drawing of the genealogical tree and many photographs of family members, so that the people who enter this space will be filled with memories.
- It is true that most memorial halls (or ancestral halls) have a very traditional design. However, the simple design is more suitable for the aesthetics of modern people, as well as being functional.
- Through the establishment of this memorial, the family members hope that the local cultural characteristics and aesthetics will be promoted to the extent that it will become a cultural and educational center for the community. It is true that many sages have influenced people through their actions in many places.

The primary purpose of the family memorial is to commemorate the ancestors, which may limit its usefulness. In contrast, "Qiyun Residence" uses a creative approach to strike a balance between the two. In actuality, as has been emphasized many times previously, modern people have limited living space and it is difficult to create a special memorial hall in this limited space. So, it would be a double win if the memorial hall also served as a living room. Therefore, the functional level of design cannot be neglected. For a variety of reasons, many of the family's old houses were demolished. Due to the long period of time that has elapsed since the old houses were built, they may no longer be suitable for living in. However, each of their bricks holds a great deal of sentimental value to the family members. Therefore, even if it is rebuilt on the original site, it may feel that something is missing, such as childhood memories. Our goal is to pass on these family traditions to future generations through memorials or other means.

To be more precise, the purpose of the "Qiyun Residence" is to miss parents, bring families together, and inherit family traditions. Accordingly, all designs are based on this concept. For example, the old photographs tell the story of the past and are used as part of the decoration of the room. In order to underscore the importance of the commemorative space, the designer aims to simplify the choice of style and form.

As the planning and details of the four open spaces in the memorial have already been described in the previous article [23], this article will be limited to showing photos of these spaces with simple explanations (see Figures 7–10).

Figure 7. The spacious and bright meeting room is not only a place for family members to discuss things, but also a space for entertaining visitors. The host will introduce you to the ins and outs of the memorial here. At the same time, family members or visitors can also write down their feelings on the whiteboard. (Source: authorized by Lee family).

There is an important distinction to be made: whereas space is limited, emotions are infinite. If necessary, pictures can be replaced on the wall. As a result, during special events, people have the option of changing their photographs. Furthermore, a large number of photographs are stored in the cloud and, at any time, family members can access the online photos that are not physically displayed as a result of limited space. It also offers a different perspective for families with limited space. Involvement between family members is constant and continuous. Through this non-fixed display or digital technology, people can view these photographs at any time.

A specific explanation of the design and purpose of the genealogical tree on the wall should be given (see Figure 11). Many photographs of family members are displayed with concise and friendly words. All of this is associated with the feelings of affection felt by each member of the family. This encapsulates the essence of "ritual sense".

Figure 8. Bar area. This area is planned for family members and visiting friends to relax. The design, which references the Mondrian's style, makes this space even more interesting. (Source: authorized by Lee family).

Figure 9. Reading room. In the future, books and materials related to family members will be continuously added to the shelves. (Source: authorized by Lee family).

4.2. The Dance of "Brushstrokes" and "Tones": Paintings Named "Home: Sweet Home"

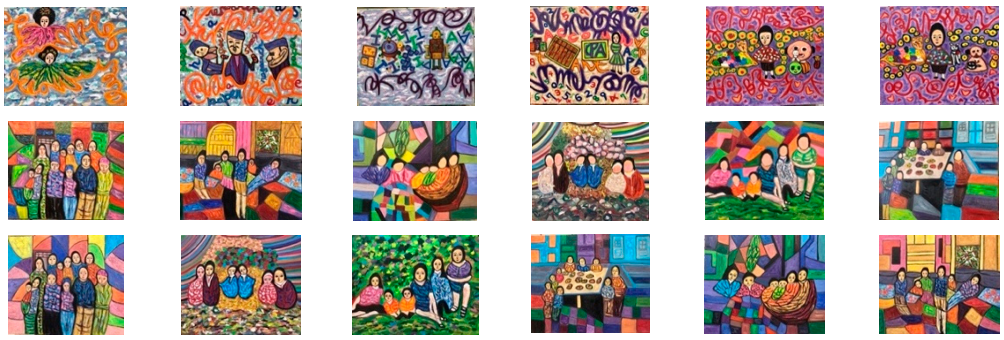
Sandy Lee, as a member of the Lee family, is well-versed in the cultural connotations and spiritual significance of her family. In her subsequent work, she created a series of paintings with the title "Home: Sweet Home" (see Table 1), which not only serve as a two-dimensional reproduction of the family memorial in the previous section, but also enable the audience to comprehend how the family relates together and how the family spirit is inherited. Despite having smartphones, the authors believe that modern people can record their interactions with their families at any given time. Even so, if one is able to portray warm family affection through a paintbrush (or other means), it can undoubtedly increase the level of enjoyment for the creator.

Sandy Lee, as a self-trained artist, does not share the mindset of an academy school-trained painter, but expresses her understanding of art in a simple and unpretentious way. A series of Sandy's paintings inspired by traditional Chinese poetry had previously been completed [18,25–29]. As a result, she is more acquainted with artistic creation and has a deeper appreciation for it, but more importantly, she can express her views more freely.

The paintings in Table 1 demonstrate that Sandy has gradually developed a unique style. In her work, she attempts to document the deep feelings and happy atmosphere between family members using bright colors and condensed brushstrokes. The painting in Figure 12 illustrates a joyful atmosphere when three generations come together.

Figure 10. The family activity and information space. The walls are covered with photographs of family members from different periods. The photos are either distributed by a specific subject or arranged by the time they were taken. In the image in the top left, Sandy tells visiting friends the story behind the photos on behalf of the family. (Source: authorized by Lee family).

Table 1. Paintings with the theme of "Home: Sweet Home".



Source: Painted and authorized by Sandy Lee.

Figure 11. Genealogical tree: Symbol of prosperity and cohesion. (Source: authorized by Lee family).

Not only in the Chinese world, but also in many other countries or regions, family members gather when special festivals take place. People often take a family portrait during this time. Even so, Sandy decided to get a paintbrush and capture such a special moment with her feelings for family members. At this moment, the atmosphere of the painting is important and it may not be necessary to depict each individual in realistic detail.

People without formal training in painting may be worried that they will not be able to paint in the details of their characters and can focus on the creation of the aesthetic of the picture. In summary, people can better identify the cohesion and the strong emotions of the family during the creation process.

Figure 12. The taste of happiness of three generations. (Source: authorized by Sandy Lee).

4.3. Discussions: The Inheritance of Family Traditions under the Interweaving of Space and Paintings

According to the members of the Lee family, the "Qiyun Residence" is unique, not only the first one but the only one. Although it is intended for other people because there is no common memory, recollection, or perception, "Qiyun Residence" may not have any significance to non-family visitors. However, "Qiyun Residence" offers an alternative approach to planning a memorial space for a family. It is argued in this study that anyone can create a memorial space for their own family, regardless of the amount of space available. Since there are various ways to present forms, connotation is the most important consideration. The "Qiyun Residence" is a new project, so there are certain limitations and shortcomings. It is hoped that the "Qiyun Residence" will be able to provide insightful information and suggestions for readers.

Most families find it difficult to create an independent memorial space, so choosing artwork to serve as a record of the family's traditions and daily life is perfectly acceptable. From a different perspective, the family memorial provides family members with the opportunity to reflect on the past, and Sandy's paintings allows them to appreciate the present (see Figure 13).

Figure 13. Paintings that reflect the strong feelings of family members. (Source: authorized by Sandy Lee).

It is our intention to provide different suggestions to our readers. It may be possible to find more ideas for readers interested in different forms of expression, such as a "family memorial" or a "home-themed painting". However, since this article only analyzes the creation of one painter for the time being, its applicability needs to be proved in future studies.

5. Conclusions and Suggestions

As a result of space limitations, most families do not design or plan a dedicated memorial space in their homes. Perhaps not everyone will paint their family members as a way to express their love. In other words, form is not of great importance. Each of the cases ("Qiyun Residence" and paintings) discussed in this study has its own peculiarities. The Lee family, for instance, has a relatively independent space that can be used for a memorial hall. The artist Sandy Lee, on the other hand, is interested in painting and has picked up a paintbrush after retiring and has been exploring color and brushstrokes. Through communication with creators, this study considers:

1. If no separate space can be found, people can refer to the model of "Qiyun Residence" and can use a corner of their home or a small room that is temporarily unused for a moderate transformation, so that a miniature version of the family memorial can be created. In the same way as the conference rooms and reading rooms described earlier, some readers may consider them to be relatively simple. However, space serves only as a means of transport and it is the inner thing that can bring family members together and let them pass down family traditions. To put it simply, it is similar to how many people keep photos of their family in their wallets or on their desks.
2. Due to the popularity of smartphones and cameras, people have the opportunity to become photographers. They can capture their family moments whenever they like. However, it is possible that these images remain on the phone for long periods of time and that the individuals will not take the time to examine them. With the advent of photographs, the art of painting is not completely eradicated, and people are willing to pick up paintbrushes and paint in their own way. Not only can these paintings be hung in the memorial space, but they also have the opportunity to become a source of inspiration for people. Furthermore, by utilizing the art of painting, the creator is also able to enjoy the challenges and pleasures that are inherent in the creative process that is unmatched by the act of pressing a shutter.

Through the introduction and discussion of the above cases, the authors aimed to provide a relatively unique style for interested audiences or researchers. Furthermore, in the cases selected for this study, their creators were effectively able to convey their ideas in an informal and rustic manner.

Last but not least, the authors conclude the article with the content shown in Figure 14. On the left side of the picture is the old house (which is no longer inhabited) of the Lee family. The building on the right, which had the same color as the old house, was rebuilt later ("Qiyun Residence" resides on the first floor of this building). Since the courtyard was

converted into the current building, the family's living surroundings have been greatly enhanced, allowing not only different families to enjoy some privacy, but also allowing the members of the Lee family to reunite, and all this is consolidated in the old house that carries many memories. It also demonstrates that with the advancement of the times, what has changed is form and material, while what has remained constant is ritual and spirit. It is this that represents the essence of sustainable development.

Figure 14. The intersection of the old and new residences: Transfer of "traditional" to "modernity" for the sustainability of culture. (Source: authorized by Lee family).

COVID-19 has caused many events scheduled for the "Qiyun Residence" to be canceled or postponed. While feedback from visitors may not constitute significant evidence, it may allow us to gain a better understanding of what others think about the monument from a variety of viewpoints. Future research will also examine its relation to the sustainable development of culture, as well as how it can enhance the role of the memorial. It is also necessary to conduct future research to validate this design suggestion and its contribution to sustainability. Furthermore, Sandy's paintings have been used in the development of our latest research plan, in which we examine whether the audience will perceive a sense of connection between family members, as well as its impact on personal character development.

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Sustainable Development Assessment of Cultural and Creative Industries in Casino Cities: A Case Study of Macao

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Abstract: In Macao, the government established the Cultural and Creative Industry Promotion Office and Cultural Industries Committee in 2010, which nominated eight to-be-developed cultural and creative industries (CCIs): design, visual arts, performing arts, clothing, pop music, film and video, animation, and publishing. However, because each CCI has its unique pattern and environmental resources are very limited in Macao, an industrial chain analysis for these eight industries should be conducted prior to policy implementation. Therefore, this study organized an industrial feasibility analysis for these eight CCIs. The methodologies included in-depth interviews, a literature analysis, and knowledge-discovery in databases. On the other hand, this study adopted the concept of creative industries, "the relationship between production and reproduction", and "the three-circle hypothetical interactive consumption" model for positioning these eight CCIs to choose existing industries in Macao, such as the exhibition, gambling, and cultural tourism industries, that are likely to promote CCIs. Next, the orientations of these CCIs are determined. Finally, it is suggested that the performing arts, design, and visual arts industries should be prioritized currently, and the heritage management and digital media industries are advised as to-be-developed ones. In contrast, the clothing, pop music, film and video, animation, and publishing industries are not so beneficial for Macao's development.

Keywords: Macao; cultural and creative industries; sustainable development; casino city

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1. Introduction

Macao has surpassed Las Vegas to become the world's number one casino city [1]. As it is a special administrative region under mainland China, the trademark of Macao's unique impression of gambling entertainment has attracted tremendous interest from the Chinese civilians and the government, which has made the authority pay attention to the positive image of the city [2], and it is proposed that cultural and creative industries (CCIs), such as design, visual arts, performing arts, clothing, pop music, film and video, animation, and publishing industries, are important measures that can be utilized to reverse the long-term gambling impression of Macao [3,4]. Consequently, the Cultural and Creative Industry Promotion Office and Cultural Industries Committee in Macao were established in 2010, which are expected to reduce the gambling image by integrating these eight CCIs with existing local advantages, and this is capable of further directing the city to develop diversified sustainable development [4]. In other words, the development of CCIs helps to vary the economic ecology of Macao, rendering the long-term sustainable development of the city. At the moment, Macao is suggested not to focus too much on the gambling industry, which could lead to the monotony of the city. The reason behind the CCIs selection is to provide a means of diversifying development in Macao because CCIs are rooted in all aspects of people's life. In general, a city develops CCIs more or less, but each of its

development maturity and suitability varies. Therefore, this paper clarifies which CCIs are suitable for Macao city to be developed preferentially. However, each CCI has its unique development pattern (requiring different resources), and as there are very limited resources in Macao (such as land), an industrial chain analysis is in urgent need of practice before any action is taken [5]. As a result, key CCIs must be clarified, and those that are suitable for Macao should be determined. Next, the project plans of Macao CCIs are recommended to be established with careful deliberations; for example, the value chain of CCIs is advised to be examined to avoid unfocused, inefficient development models that result in wasting limited resources.

When assessing whether CCIs can be developed and put into practice in a city, it is necessary to first determine whether a city is equipped with adequate production resources and market demand [6]. This research focuses on evaluating the eight potential to-be-developed CCIs nominated by the Cultural and Creative Industry Promotion Office and Cultural Industries Committee in Macao. CCIs are becoming increasingly significant, but theories on how a city's sustainability can be strengthened through CCI development are not sufficient, especially for traditional gambling cities. To better understand how CCIs connect with the existing strengths of Macao and promote urban transformation and sustainable development, a series of works was carried out in this research.

This research is sectioned into four parts. The first part is constituted by a literature review, sorting out past literature achievements, actual progress for "CCIs" and "the relationship between CCIs and cities", sustainable development and the theoretical framework of the study. Then, the deficiencies of previous studies are summarized, and we proposed works to be done in this investigation. The second part covers the research methodology, which theoretical frameworks are based on the relationship between production and reproduction and the three-circle hypothetical interactive consumption model to classify the eight types of CCIs according to their suitability for Macao's development, and introduces the research process, research materials, and research results of this study in detail. The third part contains the research results and discussion. According to the two theoretical frameworks from part two, the data are weighted, and relevant practitioners and scholars are consulted to determine if certain CCIs meet the needs of development and will be of great suitability for Macao. Finally, the data and findings are analyzed and discussed, and the prospective development logic of CCIs for Macao is recommended.

2. Literature Review

2.1. Cultural and Creative Industries (CCIs)

The origin of CCIs can be traced back to the Franks in Germany. Later, the term "culture industry" was used in a work from 1947, *Dialectic of Enlightenment*, by Theodor W. Adorno and Max Horkheimer. The term, however, at that time referred to as a cultural industry described a concept that is far from the current concept of CCIs today. At the time, Adorno and Horkheimer criticized the so-called culture industry for mass production, mass consumption, and design inspiration, which is based not on the independence of the creator or a certain spiritual meaning, but the logic of the capitalist economy [7]. In the 1980s, sociologists, represented by Bernard Miège, began to review Adorno and other scholars' views on "cultural industry," and began to replace "cultural industry" with "cultural industries." Bernard Miège believed that the term cultural industries can show that the capitalization of cultural production has complex production patterns and diversified operation logic. Although he also thought that the introduction of industrialization and new technology in the process of cultural production would lead to the commercialization of culture, it would also bring new creation and development direction to culture instead of producing the phenomenon of cultural delay as Adorno and other scholars have described. Hence, what Miège and other scholars named "cultural industries" is similar to the modern concept of CCIs [8].

Many international organizations have also been paying attention to the influence of CCIs, and have defined them from different perspectives. The United Nations Educational,

Scientific and Cultural Organization (UNESCO) first named "culture industries" and defined these as "content combining creation, production and commercialization", whose essence is intangible assets with the concept of culture, which is protected by intellectual property rights and presented in the form of products or services [9]. In 2013, UNESCO recognized that the market for cultural industries had changed dramatically due to technological developments. Consequently, CCIs have replaced the singular cultural industry. CCIs refer to "organizations whose main objectives are to produce, reproduce, promote, market, and distribute goods, services, and activities derived from culture, art, and historical heritage [10]". Numerous papers had adopted the definition of the United Kingdom Department for Digital, Culture, Media and Sport's (DCMS) for creative industries as "those industries which have their origin in individual creativity, skill, and talent and which have a potential for wealth and job creation through the generation and exploitation of intellectual property [11]". The World Intellectual Property Organization of the United States, meanwhile, considered the diverse nature of the creative industries, which covered a wide range of different kinds of activity, such as creativity and intellectual activity [12].

The development of CCIs is of academic significance, and most studies of CCIs focused on the following aspects. First of all, studies that emphasized the innovation capacity of CCIs, which area of research analyzes the role of CCIs in affecting the performance of an economy's innovation [13,14], active innovation [15,16], product innovation [17,18], firm innovation [19,20], and industrial innovation [13]. Second, the management of CCIs has also been receiving attention in academia. A debate has been positioned on whether cultural and creative industrial management "differs" from other forms of management. For many, because of the nature of their products, CCIs raise different types of managing and organizing challenges; it is because managing CCIs creative content is different from that of manufacturing products, requiring more flexibility, and the outsourcing characteristics of CCIs also create different operating and managing challenges [21,22]. Third, CCIs are considered to be a source of potential benefits of transforming culture into capital for the whole economy, affecting the social and cultural aspects of people's lives [19]; therefore, many scholars proposed policy studies from a theoretical perspective. Various studies on cultural and creative industrial policies believe the orientation of those industries are an important policy for upgrading the national economy [23,24]. As a result, some research analyzed national and civic cultures, and creative industry policies are common research topics [25–27]. Lastly, the challenges of cultural policies are also a research area that has received considerable attention [28,29].

2.2. The Relationship between CCIs and Cities

A large number of studies have investigated the relationship between CCIs and cities, and the results of these studies can be divided into the following areas. First, studies evaluated the development capacity of a city's CCIs. In the early stages of the development of CCIs, Hall (1999, 2000) indicated that CCIs would become the core activities of urban economic development in the future [30,31]. CCIs are seen by many researchers and policymakers as drivers of economic growth and a source of competitive advantage, which is important for economic survival and growth in a city [32–35]. Many studies have explored how CCIs could enhance the competitiveness of a city by developing assessment indicators and development strategies based on the creative industry of urban development. These studies mainly investigated CCIs and categorized them according to their content and objectives [36,37]. Concerning the influence of CCIs on urban and local development, several studies have indicated that cultural industries should improve the development of CCIs, set up high-tech platforms, develop promising corporate cultures, construct a sound legal system, enhance social security, and promote competitiveness through innovation, art, and the process of collective learning [38–40]. Second, studies focused on policies and strategies for the development of urban CCIs. Some studies have explained the challenges and jeopardies in CCIs within the city's creative ecosystem [41,42]. Others have proved that creative industries drive both economic and employment growth in cities [36,43,44],

and many studies have shown that CCIs can lead to the renewal and upgrade of urban policies and strategies [25,27]. Rosi (2014) presented the UNESCO Creative Cities Network (UCCN) and illustrated the theoretical and practical strategies. On one hand, there was a propensity to use the UCCN membership as a branding tool to attract investors and tourists; on the other hand, the tendency to effectively work jointly with the cities of the network to build a stronger identity [45]. Third, some studies focused on the processes of creation and mobility of CCI talent to better understand how mobility, creativity, and creative cities are connected [46,47]. Clustering is a field that has drawn great attention from academics to study the formation process of CCIs [48,49]. Both domestic and international CCI studies are mainly found on the influence of CCIs on urban and local development, elements for constructing CCI parks, and strategies and suggestions for developing CCI clusters. Fourth, the theory of city integrated with CCIs; Smith and Warfield (2008) argued that CCIs have been used in urban development based on two different approaches: the culture-centric and the econo-centric approaches [50]. Ansell and Gash (2007) considered that one form of governance is collaborative and inclusive if it involves a wide range of public and private actors from different backgrounds and interests with the aim of promoting consistency-oriented decision-making [51]. Based on the above two studies, Andre and Chapain (2013) demonstrated that the culture-centric approach is more exclusive than the econo-centric approach, and tends to lead to restrictive governance arrangements [52].

At present, the research on CCIs in Macao mainly focuses on analyzing the development status and strategic suggestions of CCIs in Macao. In terms of the analysis of the development situation, although the development of CCIs in Macao has certain policy orientation and diversified development advantages, its development presents a special unsaturated status, which is mainly reflected in the relatively lagging development of CCIs, narrow regional space, lack of human resources, and the unexplored/unexpanded commercial room of CCIs [53,54]. Due to the small scale of CCIs in Macao, much relevant research mainly analyzed the current situation from the perspective of the Guangdong-Hong Kong-Macao cluster and then makes development suggestions [55–57]. In terms of strategies, the development suggestions for CCIs in Macao mainly include optimizing the government's CCI policies and measures, strengthening the linkage cooperation and exchange with Hong Kong and Guangdong, balancing the CCI structure, recruiting creative talents, and enhancing social attention [53,58,59]. Macao's economy mainly depends on the tourism and gambling industries, and the development of CCIs based on the abovementioned industries is conducive to the sustainable development of Macao's economy [60,61]. Since human resources are the main issues in the development of CCIs in Macao, Cheng (2017) analyzed the problems of creative talents in Macao from the perspective of the 3T theory and proposed corresponding solutions [62]. This study is one of the few to examine CCI issues and strategies in Macao from a theoretical perspective.

2.3. Sustainable Development

The concept of sustainable development has been interpreted from multiple perspectives, the most common definition of which comes from "Our Common Future", famously from the Brundtland Report by the World Commission on Environment and Development (WCED). It states: "Sustainable development is a development that meets the needs of the present without compromising the ability of future generations to meet their own needs [63]". WCED recognized the importance of sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their needs [63]". Subsequently, in 1997, the UN Development Agenda, based on the Brundtland definition of sustainable development and the Elkington approach (people, planet, and profit), proposed that "Development is a multidimensional undertaking to achieve a higher quality of life for all people. Economic development, social development, and environmental protection are interdependent and mutually reinforcing components of sustainable development [64]". Others thought that sustainable development involves the use and conservation of natural resources and the direction of

technologies and institutions to achieve and sustain human needs for present and future generations [65]. In 2016, the UN General Assembly formally adopted the 2030 Agenda for Sustainable Development, which provides a framework for "peace and prosperity for people and planet now and in the future [66]". As part of this agreement, all of the UN Member States, through a process involving multiple stakeholders, agreed on Sustainable Development Goals (SDGs), which are used to indicate and measure progress towards the key SDGs [67]. According to Brundtland's report, there are eight key elements of sustainable development, such as changing the quality of economic growth [63]. In 2015, the Goals for Sustainable Development were established, which were included in the United Nations (UN)'s Development Agenda 2030. They contain 17 basic objectives, including sustainable cities and communities [68]. The key to sustainable development lies in the long-term consideration of environmental, social, and economic outcomes [69].

Research on sustainable development provides a basis for formulating social policy recommendations and identifying ways to improve the quality of life and the state of the environment, and Ehnert et al. pointed out it has made the concept of sustainable development part of the global discussion not only in the academic sphere, but also "on a broad political and corporate scale [70]". They also made a comprehensive analysis of the evolution of the concept of sustainable development in this period, which elucidated how the term, sustainable development, first became completely intertwined with the economy, and how it gradually became intertwined with the ecological, social, and corporate realm [71]. However, researchers in the field still do not have a clear and unified definition [69]. Fechete and Nedelcu said, "for sustainable development, a good measurement process should consider the total performance of the organization [72]". As Connor and Dovers argued, sustainability is "a series and hierarchy of challenges to integrate [73]"; but a few words seemed to capture the essence of sustainability proposed by Tol: "it is everything to everyone [74]". It must, therefore, be pointed out that a new and better path has been found for everyone and everything, which has begun to repair all of the damage, and that a new way of life has been created that is sustainable for all [69]. In sustainability studies, it is worth noting that some authors used sustainability and business responsibility interchangeably [75]. Therefore, this study discusses the sustainable development of Macao city from the perspective of CCI commercialization.

2.4. Theory Framework of the Study

This study will repeatedly quote the framework of "the relationship between production and reproduction" (as shown in Figure 1) as the classifying basis for the eight potential to-be-developed cultural industries. In Figure 1, the center of the figure is the creation and production source of cultural products, including authors, performers, designers, etc. The two extremes of "the relationship between production and reproduction" of creative industries are "content-to-audience" and "audience-to-content". The representative industries on the right end of the spectrum in Figure 1 include the film, television, music, publishing, and new media industries. In these industries, cultural products are either delivered to shops, stores, and cinemas around consumers' cultural consumption areas or they can appear on televisions, computers, and handheld video players at home. All of these rely heavily on a steady distribution system established by private enterprises as well as sound intellectual property laws and regulations, which can ensure that those producers can claim rights and profits when consumers purchase and enjoy all of these cultural products. The representative industries on the left end of the spectrum are the performing arts, cultural tourism, and visual exhibition industries. The consumption mode of these three CCIs is that consumers must go to a specific place and at a specific time for an experience, which is different from the experience mode of delivering cultural products to consumers through logistics. In other words, the right end CCIs occur when consumers travel to the destination of creation for consumption. The development of these "audience-to-content" industries differs from that on the right-hand side. These industries do not require industrial chains or massive distribution systems to develop; instead, they rely on a large number of floating

populations and tourists [76]. According to data from the Statistics and Census Service of Macao, a total of 39,405,758 people visited the city in 2019, but only half of these visitors stayed overnight [77]. This phenomenon indicates that Macao has the potential floating population to develop "audience-to-content" CCIs, and by enriching or popularizing these categories of industries and providing more entertainment options, it is believed that tourists would be attracted and would be willing to stay more days in Macao.

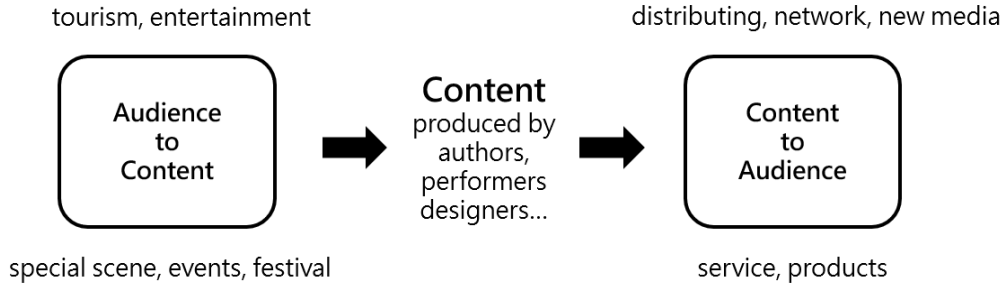

Figure 1. "The relationship between production and reproduction" of CCIs [76].

To discuss Macao's situation, we can borrow the three-circle hypothetical interactive consumption model proposed by Richard Prentice in urban marketing research, which he explored using the Edinburgh Fringe Festival as a case study [78]. Prentice put into this hypothetical interaction the three categories of "tourist historic cities", "Scottish performing arts in a Scottish context", and" international performing arts", which described the three types of tourists who spend most of their money in Scotland. In the hypothetical interaction model, the circles are not fixed but move inward or outward depending on whether the consumption patterns of tourists overlap. If the three circles are close to each other until they almost overlap, this means that the consumption blocks of tourists are highly overlapped. In other words, when a tourist comes to Scotland, he or she will not only visit the ancient cities of Scotland, but also enjoy the Edinburgh Fringe Festival. Visitors to Edinburgh's world-famous Fringe festival will also see the sights of Edinburgh. In Figure 2, picture A shows that a highly overlapping interaction is ideal, which shows that while there is a primary purpose for a trip, visitors do not spend exclusively on one type of consumption, but on a variety of things within the city that benefit many industrial sectors at the same time. Contrary to this ideal situation, picture B assumes that the three circles in the interaction are dispersed outwards with minimal or no intersection. Such interaction is not ideal because the consumption blocks of tourists do not overlap, which means they do not visit other places for consumption other than their intended purpose. Such a situation also means that the industries in these blocks cannot promote each other's growth, and in the process of publicity, due to their different consumer groups, they must pay more costs, making it also difficult to develop new customer markets.

Prentice's hypothetical interaction model in his Edinburgh Fringe study can be applied to the current gambling and tourism industries in Macao, drawing the two industries into two circles of the three-circle chart, which also shows that the current three-circle chart of Macao is incomplete, and the missing circle is the invisible and unexplored cultural and creative industry. "The three-circle hypothetical interactive consumption" model is suitable for this study because Edinburgh and Macao are both tourist cities with large population flows. In addition, both have cultural and historical heritages that attract tourists. Due to the commonality of the above analysis, the model used in Edinburgh can also be used in the analysis of Macao to a certain extent. Moreover, the theoretical model fully excavates the existing industrial advantages of a city, which is also one of the purposes of this study. According to surveys, most tourists come to Macao to spend money in the gambling industry, and the cluster formed around this industry is relatively strong and complete. When compared with the second tourism cluster, it is also much stronger. If we want to make Macao's consumer market perfect, we must find the missing link. The CCIs discussed in the present study are the unformed areas in the three circles of Macao.

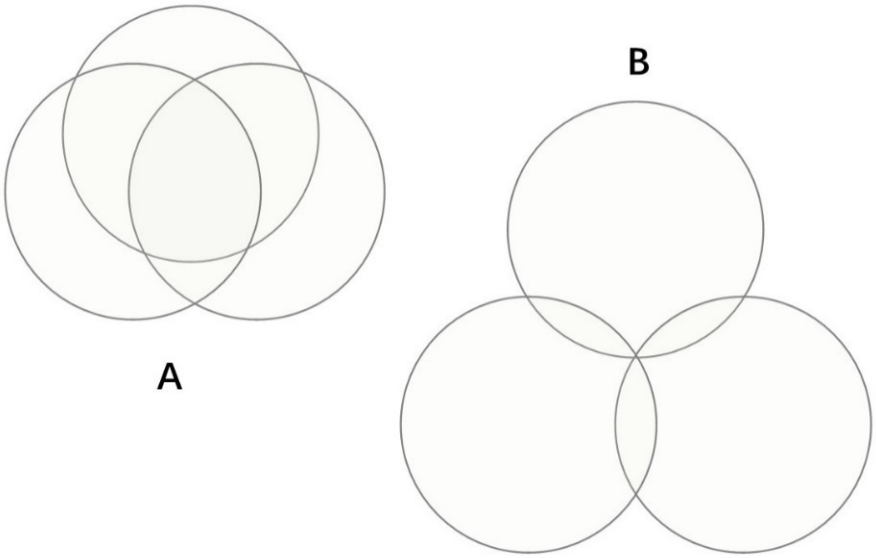

Figure 2. The three-circle hypothetical interactive consumption model [78].

2.5. Summary

The shortcomings of past studies can be summarized as follows: first, the focus has been placed more on the area of "direct policies and strategies". For example, researchers have proposed overall conceptual policies and strategies, investigated how CCIs improve urban competitiveness, developed relevant assessment indices, and formulated policies for developing CCIs directly. Such studies did not fully demonstrate the applications and connection of the "original advantageous industries" in a city, but directly focused on the aspect of "policies and strategy issues". Second, there has been less attention paid to the construction of cooperation between CCIs and the "original advantageous industries in a city". The demonstration of "CCIs in a city" is directly related to actual operation results; hence, most of the results are reflected in the specific growth of economic indices, and theoretical research has paid little attention to this aspect. Cooperation between CCIs and the "original advantageous industries in a city" could effectively enable a city to have a clear understanding of the effects of the current cooperation and accumulate valuable experience for the future sustainability of a city. However, there is no abundant research in this area. Third, despite being a new field of scientific research, it is already being explored by several institutions, such as UNESCO or the European Commission. The major problem, however, is the fact that the sustainable development of a city is not conceptually discussed in CCIs research. Overall, previous studies lacked a summary of the "connection" of cooperation between the two parties, as well as an understanding of the degree of importance of various factors of cooperation between CCIs and the "original advantageous industries in a city", and they regarded CCIs as an important means of sustainable urban development. Fourth, although there is a lot of research about the strategy for the development of Macao's CCIs, most of them lack theoretical framework support. Therefore, this paper puts forward the logic of the sustainable development of Macao's cultural industry with the help of these two theories. This study takes into account "the relationship between production and reproduction" and "the three-circle hypothetical interactive consumption" model as the theoretical framework for positioning and conducts an industrial chain analysis for the eight potential to-be-developed cultural industries in Macao. The research methods applied included in-depth interviews, literature analysis, and knowledge-discovery in databases from the Government of Macao Special Administrative Region Statistics and Census Service [79]. Afterward, Macao's CCIs were further divided into industries to-be-developed, industries without expansibility, and industries that needed to be added. The conclusions drawn in this study are of great significance in clarifying the connection between CCIs and the "original advantageous industries in a city". Further, the study

results could serve as a reference for promoting the sustainable development of casino cities, such as Macao.

3. Methodology

In this study, the empirical analysis of CCIs in Macao relied on in-depth interviews, in-depth text analysis, and case studies. We chose Macao as a typical case for this study owing to the strong representation of its image of transformation as a casino city with the help of CCIs that enable the city to have diversified and sustainable development [3]. On the other hand, some of Macao's CCIs are also an important part of China's industrial revolution, with a high reputation in Southeast Asia [80].

With these approaches, and in view of the characteristics of the different actors involved, the corresponding text sources for this study were chosen. The main texts studied were sourced from newspapers and journals, with data selected from the local government's official websites. We studied 30 relevant policies, documents, and proposals publicly issued by Macao [81]. We searched for discussions on the development of CCIs in these documents to examine how the Macao government has positioned and reimagined the city, as looking into these documents was considered an important part of the research methodology. We also collected data on cultural and creative industrial development using the websites of major enterprises and identified how enterprises and nongovernmental organizations promoted development.

When assessing whether a CCI can be developed and put into practice in a city, it is necessary to determine whether the city is equipped with adequate production resources and market demand. Current research has focused on evaluating the eight potential to-be-developed cultural industries nominated by the Cultural Creative Industry Promotion Office and Cultural Industries Committee in Macao. The analysis tools used in this study include interviewing practitioners, government managers, and scholars working or researching in the eight CCIs, and analyzing knowledge-discovery in databases provided by the Macao Government Statistic Office [82,83] to determine if certain nominated cultural industries meet the needs of development and would be of great interest to Macao. In other words, the analysis framework of this study was based on taking into account the practitioners of CCIs, including governmental personnel, company owners, artists, designers, and so on. Hence, we interviewed the above people through field research. We visited the study locations three times from February 2019 to September 2021. A total of 20 key interviewees were interviewed using semi-structured interviews that each lasted 15–40 min. The contents of the in-depth interview are mainly 5–10 questions about the development status of the CCIs in Macao.

In this study, "The relationship between production and reproduction" and "The three-circle interactive consumption" were chosen. The reasons for choosing "Model" as the theoretical framework of the study are as follows. "The relationship between production and reproduction" applies to this study because it classifies CCIs into two categories based on the consumption mode of cultural products. Such a classification is helpful for this study to preliminarily consider what types of CCIs can be developed in Macao as a city with a large population flow. Macao's original advantageous industries, such as casinos, tourism, conventions, and exhibition, can quickly exclude the types of CCIs that are not suitable for development. Moreover, "The three-circle interactive consumption" model is suitable for this study because Edinburgh and Macao are both tourist cities with large population flow. Casinos, conventions, and exhibitions, each segment is forming an important element of one of the three circles in Macao. In addition, both cities have a cultural and historical heritage that drives tourists to visit, which forms the second round of the three circles of Macao. As per the above mentioned, the model adopted by Edinburgh can also be used to analyze Macao to some extent (Figure 3). Besides, the theoretical model fully excavates the existing industrial advantages of a city, which is also one of the purposes of this study.

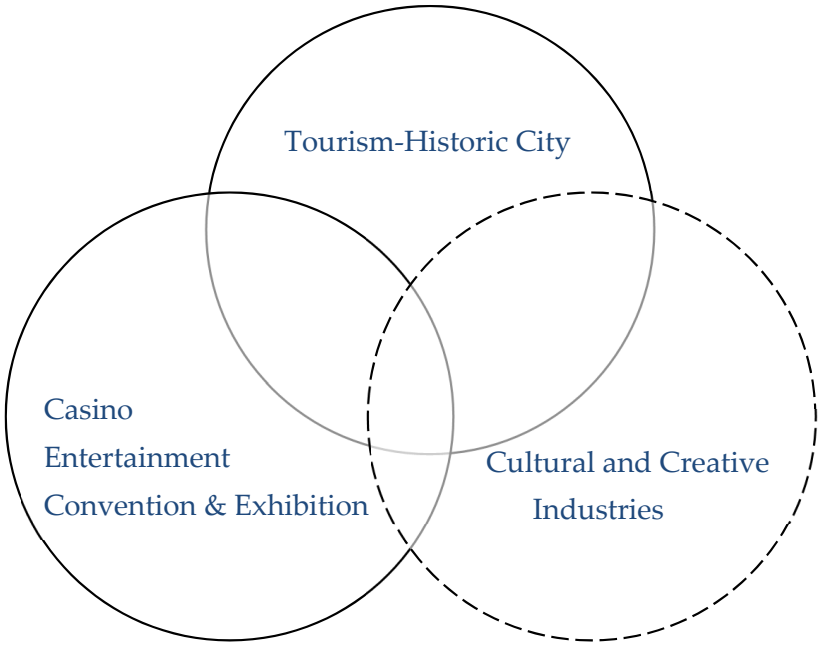

Figure 3. The application of the three-circle interactive consumption model in Macao.

4. Feasibility Analysis of Macao's CCI Development

Before assessing the sustainable development of Macao's CCIs, the eight to-be-developed CCIs in Macao must be individually analyzed to understand their development feasibility in Macao, and the development of CCIs should be classified according to the urban characteristics of Macao. Therefore, in this section, this study analyzes the eight to-be-developed CCIs in Macao to clarify the possibility of the development of the eight CCIs in Macao according to their characteristics.

4.1. Design and Visual Arts Industries

The design and visual arts industries include art forms, such as ceramics, drawing, painting, sculpture, printmaking, design, crafts, and architecture, which can be divided into two models of the industries. One model is called B2B (business-to-business), which mainly encompasses the provision of design services, such as designing advertisements for commercial products, interior design, and decorating business offices. The other model is B2C (business-to-customer), which involves product design. According to research on the cultural industry in the United Kingdom, the traditional definition of workers in the field of visual arts is that such individuals make a living by selling their creations (their finished products). However, nowadays, workers in the field of design and visual arts have 25% of their main income sourced from selling their creations, while the rest of their earnings comes from B2C services [76]. In other words, the majority of revenue in the design and visual arts industries comes from B2B services. With the booming development of the gambling, exhibition, and tourism industries in Macao, the visual arts industry has been enhancing the value and competitiveness of those industries, while these industries bring steady upcoming B2B customers for the design and visual arts industries. For example, 1536 exhibition events were held in Macao in 2019 (as the data of exhibition numbers in 2020 and 2021 are affected by COVID-19, the data in 2019 is used as research evidence) [82], which demanded huge support from the visual arts industry. The gambling industry spent MOP 3880 million (about USD 484 million) on marketing and promotion, and MOP 1540 million (about USD 192 million) on building renovations in 2019 [83]. Another example, the cost of the exhibition hall production and site layout accounted for 37.4% and 35.4% of the total annual expenditure in the past two years, respectively [82]. It shows that the existing conference industry in Macao spends more than

one-third of its expenditure on the design and visual arts industries. It demonstrates the demand of the conference industry for design and visual arts industries, and the ability of the exhibition industry to drive the development of design and visual arts industries. Hence, there is a strong interconnection between the design and visual arts industries and existing industries in Macao, such as the gambling, exhibition, and tourism industries.

The design and visual arts industries can be seen by people in their daily lives; hence, these industries serve as key factors in impressing the core value of a product in consumers' minds. Whether Macao develops cultural industries or any other types of industries or enterprises, the design and visual arts industries are important components in enhancing enterprises' innovating ability and competitiveness. According to the Statistics and Census Service of Macao, the design and visual arts industries contributed MOP 2473.9 million (about USD 307 million) in output service value in 2019, which is MOP 373.6 million (about USD 46 million) higher than the previous year [84]. This data further confirms the economic contribution of the design and visual arts industries in Macao. In addition, these industries can function through means such as beautifying the city's appearance and glorifying the image of the city, which can serve as the driving force for cultural tourism and increase revisit intention [85,86]. Although Macao is a cultural tourism destination, there is still room for improvement in the design and visual arts industries, which also reflects the importance of these industries to Macao. At present, the development of these industries has not matured completely yet, so future efforts and support are still needed [87]. Post-visiting, which refers to the end of the journey or after the journey, is also an important traveling phase that affects tourists' impressions of a journey [88]. In this phase, souvenirs are key elements for tourists to retain their memories. However, as a famous tourist destination, the gift shops in Macao all around are insufficient and immature, and the design and visual arts industries can come in and assist with souvenir design and production. The development status of the design and visual arts industries is becoming a key factor in promoting a cultural city image in Macao.

4.2. Performing Arts Industry

The performing arts include forms of creative activity being performed in front of an audience, such as drama, music, and dance. Among all CCIs, "live shows" are the most audience-driven. This also means that the performing arts industry belongs to CCIs of the "audio-to-content" type. Macao has diversified types of lodging and sufficient accommodation to cope with many visitors. According to the Statistics and Census Service of Macao, the number of arrivals to Macao increased from 30,714,628 in 2015 to 39,406,181 in 2019 [89], and the number of hotels increased from 99 in 2014 to 124 in 2020 [90]. The two high-level casino resorts in Macao, The Venetian Macao and The City of Dreams, can provide appropriate spaces and facilities for performing groups. For example, the Venetian Macao is equipped with the Golden Light Museum as a multi-functional indoor performance venue and the Venetian Theatre [91]. For another example, The City of Dreams is accompanied by the stunning "House of Dancing Water", which features approximately 2000 seats and is designed and organized by the world-renowned Sandi Pei of Pei Partnership for 5 years, worth more than HKD 2 billion (about USD 25 million) [92]. In addition, these gambling industries have transformed their businesses into a broader realm of gaming entertainment by combining their businesses with performing arts, an example of which is the water show called the "House of Dancing Water". According to *The Statistical Yearbook 2019* (as the data of exhibition numbers in 2020 and 2021 are affected by COVID-19, the data in 2019 are used as current research evidence) from the Macao Statistics and Census Service, the performing arts industry has generated MOP 1441 million (about USD 180 million) [93]. Furthermore, according to *The Cultural Industrial Statistical Yearbook 2019*, in the "cultural exhibition" sector, which focuses on performing arts production, the number of operating establishments increased by 21 to 193 and the number of staff increased by 15.4% to 2291. Annual service revenue amounted to MOP 1.22 billion (about USD 151 million), accounting for 84.6% of the segment, an increase of 2.2%. Large organizations increased the

operating expenses for publicity and promotion, performance and exhibition production, totaling MOP 160 million (about USD 19 million) in 2019. A total of 76 performing arts training organizations were operating; an increase of five over the previous year. Their staff increased by 7.3% to 630. Total fixed capital formation increased 24.1% to MOP 4.3 million (about USD 533 thousand) [93]. These data show the potential of the performing arts industry in Macao. The abovementioned advantages have set up a solid foundation for Macao to develop the performing arts industry [94]. If Macao could further magnify and extend its advantages in gambling entertainment, then more visitors would be attracted, which would enrich and stimulate the performing arts industry in Macao and endow the gambling industry with entertainment elements of more cultural depths. According to data from the Statistics and Census Service, a total of 39,405,758 people visited the city in 2019, but only half of these visitors stayed overnight. If Macao can develop the performing arts to improve the entertainment options in the city, it could increase the length of stay of visitors to Macao [95].

In addition, the main characteristics of the performing arts are to foster talents with a high degree of penetration in CCIs, such as playwrights, stage designers, stage performers, and costume designers; related techniques and technologies, for instance, from basic lighting design to high-end stage display technology, will benefit the development of this industry. Moreover, as these talents become more experienced and sophisticated, they can not only improve the quality of the performing arts industry in Macao, but also be involved in other related cultural industries, such as design, clothing, and even the film industry. On the other hand, this industry can offer job opportunities locally for graduates from design and culture-related majors. In terms of talents and technologies, the advancement of the performing arts industry would have a positive effect on Macao's overall CCIs.

4.3. Clothing Industry

Should the clothing industry be developed successfully, the industry would be able to support numerous finished product outputs continuously. Land and human resources are the fundamentals for the development of the clothing industry. Although Macao's clothing industry had flourished in the past, because of the advantages of the above two resources in Mainland China, Macao's clothing factories have gradually moved to the mainland. Macao currently relies on the tourism industry as its core value for economic development, which is not suitable for conducting too much land development as it leads to pollution of the land and natural resources because the clothing industry is also based on the consumption of land and the environment.

Macao's land covers 32.9 square kilometers, and, compared with Mainland China's vast hinterlands, Macao is no longer suitable for developing the clothing industry. Regarding Macao's clothing industry, an interview with manager Guan Zhiping from the Macau Productivity and Technology Transfer Center was conducted, and he claimed,

> *Macao has no official top-end fashion training school for potential talents in the field of the clothing industry, and the small population makes it such that there is a shortage of techniques and talent. At present, only the Macao Productivity and Technology Transfer Center offer related professional training. The program lasts 18 months, and a certificate is issued upon completion. Every year, approximately 15 to 20 students graduate from the center. Due to the good economic development in Macao, designers who engage in clothing design have other jobs on weekdays, so instead of being full-time designers, they only do clothing design on weekends. The clothing markets in Macao are quite small, such as the T-shirt, do-it-yourself, flea, and tailored markets. Macao is still unable to develop large clothing designer brands like Hong Kong. In addition to small design studios, there are also businesses that design and produce uniforms for hotels and festivals, which are not real fashion designs*. [96]

In addition to the limited resources mentioned above, if the clothing industry is to be further developed or transformed into a fashion design industry, more professional branding talents and marketing strategies are needed, which are currently greatly lacking

in Macao [97]. According to the above discussion, it is concluded that the clothing industry is against the types of cities suitable for Macao's development, which is for consumers to consume in specific destinations. Therefore, the clothing industry belongs to the "content-to-audience" CCIs, which is not appropriate for the development of Macao.

4.4. Pop Music and Film Industries

The pop music and film industries belong to the "content-to-audience" classification of industries, which requires specialized professionals, sound distribution systems, and mature media networks. However, Macao is still in the early stages of the development of the pop music and film industries, and the above conditions are not yet up to standard. Regarding the pop music industry, live music in pubs or bars is the majority in Macao; however, this cannot be categorized strictly as a pop music industry (it belongs to music activities). In the film industry, Macao has the advantage of owning famous and popular movie scenes, and therefore, many film workers come to the city to shoot. However, only a few films are released by Macao itself in a year. Nevertheless, several new local three-dimensional theater projects have been launched by gaming practitioners who seek to focus on entertainment.

This study targeted data collection toward education units related to the film and video and pop music industries, and only one program related to these two industries (named Film Management and Production) was found at the Macao University of Science and Technology. This implies that there is a shortage of talent training for the pop music and film industries in higher education training. As a result, these talents receive training and experience at large companies specializing in music or film production. Furthermore, funding is also an important factor. The scale of the music and film market and production in Macao is so small that investment is deficient. According to *The Statistical Yearbook 2020* published by the Macao Statistics and Census Service, in the film and video market, there were five cinemas in Macao and 76 production and distribution units, with total revenue of about MOP 115 million (about USD 14 million) [98]. Compared with 2011, the number of cinemas decreased by two units. There were seven television and radio broadcasting stations in Macao in 2016 [99]. When comparing the number of cinemas in 2020 with that of 2016, the number dropped by three units. The local media distribution system in Macao is not as large as that in Hong Kong and Taiwan. In addition, some research proposes that the current challenges facing the movie and television industry in Macao are: (1) ignoring the concept of organizational innovation; (2) lacking a talent cultivation system; (3) lacking core knowledge and key personnel [100]; and (4) Macao films still face the structural contradiction of insufficient supply and sometimes oversupply in the local market [101,102].

However, the products of film, video, and music require a massive media distribution system that can effectively and successfully deliver these products to potential consumers. The abovementioned data show that the size of the film market in Macao is obviously small, and it is gradually decreasing. As for the local market demand, live shows occupy the majority, such as live performing arts in hotels, bar singers, and bands. However, in Macao, there are no local talents and planning units in related fields; hence, performing opportunities in the music market would turn to foreign or overseas professionals, such as those from Hong Kong or other places.

4.5. Animation Industry

The animation industry belongs to the "content-to-audience" classification of industries, as its manpower resource requirements demand an exquisite division of workers and highly specialized technology, and the full completion of the work also needs a mature distribution system. In Asia, opportunities for the Asian animation industry have been brought to full play by Hong Kong and Japan, whether in manga or anime. There are also many famous works from Hong Kong, and it has even adapted manga or anime to other forms of cultural productions, such as online games and television series. In recent

years, even the nearby city of Guangzhou has developed and strengthened the animation industry. Macao faces a hostile environment lacking in talents and distribution systems. Macao still has a long way to go before developing its small number of animation works into a mature animation industry. Li's (2012) research proposed that under the current conditions and actual situation in Macao, it is not optimistic about the development of Macao's animation industry. The reasons come from the following aspects: for example, due to the influence of the real estate industry structure, it is extremely inclined toward the gambling industry, and it is difficult for small and medium-sized enterprises to survive, not to mention the immature animation industry. Macao is lacking a better broadcasting platform and superstar effects for professionals or animators, respectively. Consequently, Macao is not able to establish a unique image or style in the animation field [103]. Other research also asserted that Macao's animation industry is small in scale and has little influence on surrounding cities [104]. This study interviewed Mr. Cui Deming and Mr. Jin Hui, who have had many years of experience in the toy design industry. The following information is the comprehensive conclusion of the organized interview draft combined with the investigation of this study. The animation industry in Macao is now in its initial stage, and more than half of the workers in the industry are amateur cartoonists having their own small-scale personal studios, but the animation industry requires a highly specialized division of labor and many human resources. In addition to the professionalism that is needed, the required talents have to be experts in the production process of a certain stage. However, talents cultivated locally in Macao can be used only in graphic design, and other animation talents do not have commercial competitiveness. The development of the animation industry in Macao is inadequate in terms of talent and resources [105]. This study also interviewed Xie Kunze, a general manager of the content and image division of China's first animation company, Aofei Animation Culture Co., Ltd. (Guangzhou, China), and he mentioned,

> *To improve and optimize the development of the animation industry, animation producers must first have a basic local market that cannot be too small, and they need to understand the needs of the local culture in order to integrate their works with the local culture*. [106]

Obviously, due to the insufficient market demand, which is the primary prerequisite for developing Macao's animation market, and the lack of a professional distribution system [104], it is hard to expand the industry to overseas markets, or even to compete with neighboring cities.

4.6. Publishing Industry

The publishing industry also belongs to the "content-to-audience" classification of industries. Hence, the demand for integrated industry chains and land resources is no less than that of other cultural industries. In addition, the book market in Macao is too small, and most Macao writers tend to write literary works, which results in a relatively narrow reader group [107]. According to the latest statistics from the Macao Central Library, there were 638 books published in Macao in 2020 [108]. In addition, a study pointed out that more than half of the 638 books are government publications, which infers that these publications are of less value in the market mechanism. There were 200 publishers in 2020, but nearly three-quarters belonged to non-profit organizations, and they published fewer than 10 books a year on average, with the majority publishing one to three books. The above data show that the publishing industry in Macao has not formed a large-scale commercial operation. Access to brick-and-mortar bookstores in Macao is limited, and the Pin-To Livros bookstore in Discussion Official Plaza is the only one that is close to consumers. However, because of the noisy surroundings and crowded tourists, the bookstore cannot be easily found. Brick-and-mortar bookstores are the most direct way to allow books to reach consumers. It is evident that in Macao there are problems, such as the shortage of access to bookstores and a lack of commercial publications. The publishing industry of Macao should start with these aspects to improve access to bookstores and cultivate consumers' reading habits.

4.7. Summary

Based on the above findings, a comprehensive Table 1 was developed containing the characteristics of each major industry, the role of each CCI in local and regional development, and development recommendations.

Table 1. Development characteristics and suggestions of eight CCIs in Macao.

Type of CCI	Industrial Characteristics	Effects of the Local and Regional Development	Development Suggestions
Design and Visual Arts Industries	1. audience-to-content 2. content-to-audience	These industries can enhance the value and competitiveness of the gambling, exhibition, and tourism industries currently existing in Macao	Industries to-be-developed
Performing Arts Industry	audience-to-content	The performing arts industry is enriched and stimulated in Macao which can endow the gambling industry with entertainment elements at more cultural depths	Industries to-be-developed
Clothing Industry	content-to-audience	The former clothing factories in Macao have been transferred to mainland China. In addition, tourism is the main development industry of Macao, so it is not suitable for the development of the clothing industry, which is prone to environmental pollution	Industries without expansibility
Pop Music and Film Industries	content-to-audience	These industries are still in the early stages of development, lacking mature distribution systems and media networks	Industries without expansibility
Animation Industry	content-to-audience	There are also many famous productions from Hong Kong and Japan. Macao faces a hostile environment with a lack of talent and distribution systems	Industries without expansibility
Publishing Industry	content-to-audience	The annual output of Macao's local commercial publications is low	Industries without expansibility

5. Discussion: Development Logic of CCIs in Macao

This section applies the concept of "the relationship between production and reproduction" and "the three-circle hypothetical interactive consumption" model to analyze the development logic of cultural industries in Macao. The representative "content-to-audience" industries include the clothing, pop music, film, animation, and publishing industries, which rely on a perfect distribution system established by private companies as well as a sound industry chain. Under the restrictions of geographical and human resources, it is not suitable for Macao to develop such industries. In addition, the second category of cultural industries is "audience-to-content", such as cultural tourism, exhibitions, performing arts, museums, etc. As Macao has a large flow of visitors as well as mature exhibition and hotel equipment, it is a feasible direction and basic logical thinking that CCIs in Macao should be developed.

5.1. Orientations of CCIs in Macao

The performing arts industry belongs to CCIs in the category of "audience-to-content", according to the "the relationship between production and reproduction" classification concept of the creative industry. In addition, from the perspective of the pure exhibition, the design and visual arts industries also belong to the CCIs in the category of "audience-to-

content". The well-known prosperities of the three major industries, the cultural tourism, gambling, and exhibition industries, are the driving force of an endless stream of tourists for Macao, which should serve as foundations for Macao to develop "audience-to-content" cultural industries, and it also reflects its unique advantages of the cultural industry development in Macao compared with other cities. One of the advantages is that the development of these three major industries has raised the demand for the design and visual arts industries, providing designing services for the major industries. The gambling industry improves the diversified development of the performing arts market under the differentiated entertainment business concept. In addition, endless visitors to Macao sustain stable customer sources for the performing arts, design, and visual arts industries. Therefore, Macao should utilize its own three advantageous industries and their demands for CCIs as auxiliary foundations for developing the performing arts industry as well as the design and visual arts industries. All in all, Macao is recommended to focus the development directions of CCIs on the logic of "audience-to-content".

As for the clothing, pop music, film, animation, and publishing industries in Macao, the successes of these industries' development must be equipped with complete industrial chain structures, specialized divisions of labor-consuming huge human resources, and perfect distribution systems. Based on the analyses of eight cultural industries' development conditions in Macao, the developing conditions and needed resources required for the clothing, pop music, film, animation, and publishing industries are very restricted or the development scales of which are in the initial stages, so the integrity and maturity of the industrial development conditions are insufficient. According to the concept of "production and reproduction", the clothing, pop music, film, animation, and publishing industries belong to the "content-to-audience" industries. It is not appropriate to develop such industries in cities such as Macao, where resources are restricted in space and manpower. Macao is suggested to supply services of a certain industry link or utilize the exhibition end as the main orientation for the future CCIs planning direction.

According to the above theoretical analysis results, the relationship between the existing advantageous industries and the eight cultural industries in Macao was plotted by the researchers, as shown in Figure 4.

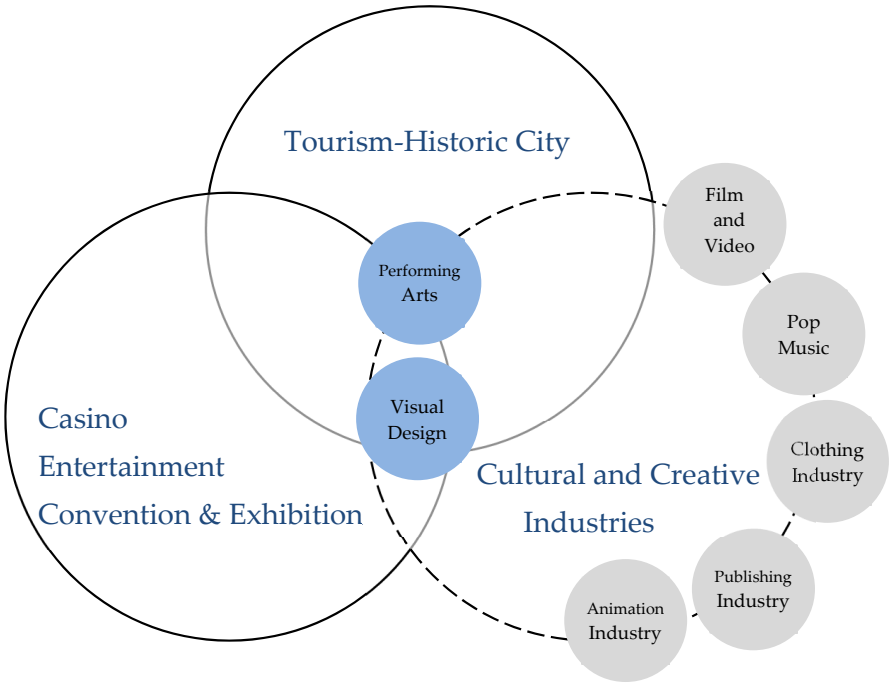

Figure 4. Orientation map of CCIs in Macao.

The performing arts industry and the design and visual arts industries belong to the "audience-to-content" CCIs, which are suitable for the development of tourist cities such as Macao. In addition, such CCIs have tight associability with the existing advantageous industries in Macao: the cultural tourism industry, the exhibition industry, and the gambling industry, which are audience-driven industries. Moreover, the talents cultivated by such industries, such as those in the fields of design and performing arts, can also be applied to a wider range of industrial and commercial companies. Therefore, these kinds of CCIs are more likely to be developed in the future. In this way, such CCIs should be the focus of the development categories in Macao in the future.

The clothing, pop music, film, animation, and publishing industries belong to the "content-to-audience" category, whose common characteristics of successful development are being equipped with mature and complete industrial chains from the original chain to the market chain. However, Macao belongs to the "audience-to-content" tourism experience category of cities, where development is limited by geographic space. The immaturity of the mass media communication system leads to a lack of huge distribution systems, making it unable to support "content-to-audience" industries. Moreover, according to the analysis results in this section, it is hard to query the scales and outputs of such industries in the database of the Macao Statistics and Census Service, which reflects the fact that Macao does not have the advantage of any complete industrial chain in the development of such cultural industries or that such industries are in the primary development stage. Coupled with the fact that such industries cannot be combined with the existing industries in Macao, the future planning direction can only take charge of a service character in the original chain or display chain.

5.2. Industries That Need to Be Added

During the surveying process, this study found that, except for the above eight cultural industries as shown in Figure 3, Macao is advised to add the heritage management and digital media industries according to its demand, as these two industries help cultural industries to be more closely linked with the existing industries, promoting their development thoroughly and completely.

5.2.1. Heritage Management

Tourist gaze refers to tourists visiting tourist spot attractions in order to find differences from their daily lives [109]. Macao has rich cultural heritages, including its historic center, which was listed on the UNESCO World Heritage List on 15 July 2005, becoming the thirty-first world heritage site in China. An investigation of Macao's local tourist resources by Hilary Du Cros shows that Chinese tourists and tourists from abroad rank the Ruins of St. Paul as the first tourist spot to visit in the city, but the pastiche-style cultural theme park Fisherman's Wharf is their last choice, which reveals that tourists value the authenticity of cultural spots [110]. For many historic cities, it is easy to include cultural heritage characteristics into cities, with tourism as the main direction. The key reason lies in the nature of the heritage site itself, which makes tourists feel as if they are at different tourist attractions at different times. This is caused by the demand for high-quality management of the heritage itself. The marketing of a place depends on the qualities of vibrancy or vitality, while the prominence of cities as cultural hubs follows patterns of cultural consumption in cultural tourism and the attraction of aspirant arts professionals as producers and consumers of a city's image [111]. The book *The Tourist City* mentions that tourists use all kinds of senses to perceive a place; hence, tourist attractions should avoid any negative messages to create a positive image [112]. However, taking the Ruins of St. Paul as an example, which is the most famous cultural heritage site in Macao, it is close to people's residences, and the residential clothing and cultural heritage are in the same space, which indeed reduces the sanctity of the tourists' experience in connection with the heritage site. In addition to the halo of a world heritage site, maintaining its value in tourists' minds has

become an issue for Macao; thus, heritage management has become a necessary unit to be set up in Macao.

Despite criticism for its heritage policies, Macao has done a better job of conserving its built environment than many of its neighboring territories that have experienced rapid urban development in recent decades. Heritage conservation in Macao was introduced relatively early. It can be traced back to the 1950s when the government created a registered list of the city's architectural monuments considered important to represent the Portuguese state [110,113,114]. By the 1970s, accelerating redevelopment led to the enactment of new legislation to protect the city's historic precincts, which included the Avenida Almeida Ribeiro, an important old commercial district. In 1982, the government founded the Instituto Cultural of Macao to take charge of implementing cultural and heritage policies [115]. In 1987, the government implemented new planning strategies intending to preserve the city's historic precincts while addressing the need for urban expansion. This resulted in several major reclamation schemes located away from the old city center. Along with other newly launched infrastructure and building projects, fueled by speculative investments in this period, they would also mark the beginning of a new phase of radical transformation of the city [115]. The Cultural Heritage Department was established by the Portuguese administration in 1976 under the supervision of the Instituto Cultural of Macao [110,115]. The primary task of the department is to classify and conserve Macao's built heritage, particularly its large stock of colonial-era architecture and monuments. Although the government has long prided itself on doing a good job of protecting its historical buildings, no system had been set in place to provide proper training for local conservation professionals until the end of the colonial period [113].

For the maintenance and management of cultural heritage, it is advised to carry out further overall planning and management of the surrounding environment rather than only completely repairing buildings in historic urban areas in a passive way. Starting from circulation management, it would be appropriate to guide tourists in Macao to visit other sites with historical and cultural characteristics and create a new beautification design for the historical site through circulation planning, which could additionally ease the usual overcrowded visitors from the Ruins of St. Paul. Such planning can not only optimize the integral city image of Macao, but also provide employment for the local design industry. In addition, the surrounding environmental planning of historic sites is one of the key objectives advised to be established by heritage management, such as selecting conditions and categories of surrounding business presences and setting up souvenir shops in the sightseeing circulation planning at the appropriate time. In other words, through integral heritage site planning, another "tourism bubble" is likely to be created to attract visitors. Specific and famous mixed-purpose street blocks, gathering a high concentration of cultural sites, serve as a focal point for tourist attractions [115]. For example, Dublin's Temple Bar in Ireland has been reborn from the crisis of the old city under the concept of building cultural quarters [116]. The planning of the Temple Bar cultural quarter is suggested to be referred to by Macao heritage management.

Although the local CCIs in Macao are still in their incubation stages, they are equipped with active cultural community activities [117]. Another objective of heritage management units organized and executed by the public or government sector is to create a complete combination of local cultural community activity and cultural heritage. Under such planning, the tourism value of cultural activity in enriching the heritage area lies in the probability of visitors returning and visiting again. By leasing idle buildings for cultural activities, the government can, for example, convert the idle space into a small-scale theater or rehearsal hall as well as exhibition and performance venues for diversified performance and exhibition places in Macao. In addition, site management personnel can also be provided to maintain the sustainability of the exhibition and performance venues, even beautify the environment, and further develop them into tourist attractions to solve the congestion problem in the major tourist sites in Macao. In an interview with our research team, the Cultural Bureau referred to the same concept:

> *The planning focus of the Cultural Property Office is on the activation of the old district, which means developing several nodes in the tourist attraction into exhibition and sale places, or inserting key demand spaces into the adjacent area of urban space on the basis of cultural community activities. For example, the Cultural Bureau can insert the leased rehearsal hall into the area targeting the performing arts. Through the polycentric activation of the old district, cultural activities in such places can also be ensured not to be divorced from public life or tourist routes. Shifting from the conservation aspect to the activation aspect, these node spaces in the city can be optimized, the local cultural environment in Macao can be gradually improved from each point, and the line can be expected to be connected under long-term planning, which may even become a plane for the production and consumption of cultural activities*. [4]

For Macao, whose development of CCIs is in its initial stage, it is appropriate to make timely use of its basic tourism resources and to make a comprehensive, integrated plan for CCIs and cultural tourism. Huddersfield is a good example of how a smaller town or city's culture has contributed to the regeneration of the town and the wider local authority district [118]. Italy also uses the concept of cultural districts, which combine with its local legacy of history and art, while the planning of the districts emphasizes the protection of cultural heritage and its new value orientation [119]. Macao, a cultural tourist city, can refer to the planning of cultural districts in Italy to manage its heritage.

5.2.2. Digital Media

Even though local digital media in Macao is still in its infancy, there is still a need to add this industry to the list of industries to be developed. Digital media has a wide range of diversified functions, such as entertainment application, education promotion, business purposes, and information sharing, which are necessary basic industries and projects for the development of a city. In the classification of creative industries, the United Nations Conference on Trade and Development (UNCTAD) also includes digital media as one type of project. Hence, the digital media industry is bound to complement other industries to be integrated with the world if a city intends to develop its cultural industry instead of acting blindly. The digital media industry can also be divided into two modes, which are the same as those of the design industry. The first mode is referred to as B2B (business-to-business), which mainly includes the provision of services, such as providing web erection services for other manufacturers or merchants; the other mode is referred to as B2C (business-to-customer), which mainly includes the selling of digital media products to customers. With the vigorous development of the gambling, tourism, and exhibition industries, it is an undeniable fact that Macao has a demand for digital media in the B2B mode. However, there is still room for improvement since Macao is still in the infant stage of development in this aspect. In addition, the perfect development of the digital media industry can improve the tourism industry or general industrial and commercial companies in the city. Moreover, it is inevitable that digital media will be combined with the design industry for further development. Therefore, the development of the digital media industry can also drive the design industry and provide the channels for local cultural products in Macao to be sold outside.

Under the restrictions of space, digital media serves as the main channel for approaching the city, which is also the primary way for foreign people to get to know a city and the main ways to establish a first impression of the city. With the tourism industry as the leading industry in Macao, digital media has become an industry-related project that should not be neglected. Before sightseeing, tourists must learn about the city through relevant official tourism websites. At this moment, digital media becomes the spokesperson of the city, which plays a critical role in deciding whether the city can be promoted outside, whether the city may become the first choice of tourists, and whether the city may leave a good impression. The appeal of modern tourism is concentrated on experience [120]. However, during the research period, the researchers queried the relevant websites of government units in Macao several times and found that the website design and planning

in Macao were not humanized; further, it is not easy for people to obtain data. From the fundamental websites to the public interaction multimedia set-ups in tourist attractions, these provide inadequate information on aspects such as public transport and tourist attractions. In particular, the survey experiences of the research team's visits to the attractions of Macao several times reflect the fact that Macao has not set up a facility for tourist interaction in tourist attractions, not to mention multimedia interactive projects. As a result, Macao should actively combine the tourism industry and digital media effectively. At present, Macao should start by re-planning its tourism website and further setting up interactive multimedia projects in tourist attractions. Such a combination can effectively improve the degree of convenience for tourists to query data and the attractiveness of tourist spots, which may correspondingly raise tourism willingness.

The analytical findings in connection with the abovementioned cultural industrial chain shows that the main restrictions for developing CCIs in Macao could be the narrow development of local markets, small manufacturing spaces, immature distribution systems, and other problems. Several interviewees in this study also put forward the importance and demand of digital media. Since digital media has cross-border influence and the capability to make up for the lack of development of CCIs in Macao, original works in Macao can be published to overcome the market and space barriers. Moreover, digital media also has a direct impact on various stages of the industrial chain itself. In the original stage, it can increase the work efficiency and output quality of industrial workers and can even provide amateur workers with simpler application media tools to improve the output quality; in the manufacturing stage, it can improve the production and communication efficiency between various units; in the marketing stage, it can expand the marketing field through the diversified applications of cross-media; and in the market (display) stage, it can overcome the market and space barriers, and can increase the number of consumers. Moreover, digital media can even push the optimization and diversification of various current cultural activities in Macao.

Although the economic performance brought about by the development of digital media cannot be measured in a short time, it is still worth focusing on the operation of such a project in Macao when considering long-term plans and its extra advantages in various industries. At present, the application of digital media in Macao presents a relatively low-quality state. The Macao government should invest more funds and staff into the positive development of the digital media industry. Starting from the establishment of relevant departments on digital media systems, it would be appropriate to cultivate digital media talents and put talent into various industries in Macao to help it rapidly enter the electronic era, which will serve as the basis for the cultural industry development in Macao. In addition, it is necessary to improve the website system of Macao tourism to be more user-friendly and to add interactive digital multimedia at hot attractions in order to increase the interest in the attraction and prolong the stopping time at a single tourist attraction. Most importantly, it is encouraged to assist various industrial and commercial companies to improve their maturity levels in using digital media, which will contribute to operational efficiency and network publicity for industrial and commercial enterprises in the whole city.

5.3. Connection Benefits of Cultural Industries and Existing Industries in Macao

As shown in Figure 5, the digital media, performing arts, and design and visual arts industries are closely linked with the casino, exhibition, and tourism industries that have been developed to be quite mature and have been advantageous in Macao. The digital media, performing arts, and design and visual arts industries also provide value-added services for the above three existing advantageous industries. This study only discusses the connection benefits between these cultural industries and the existing advantageous industries in Macao in general.

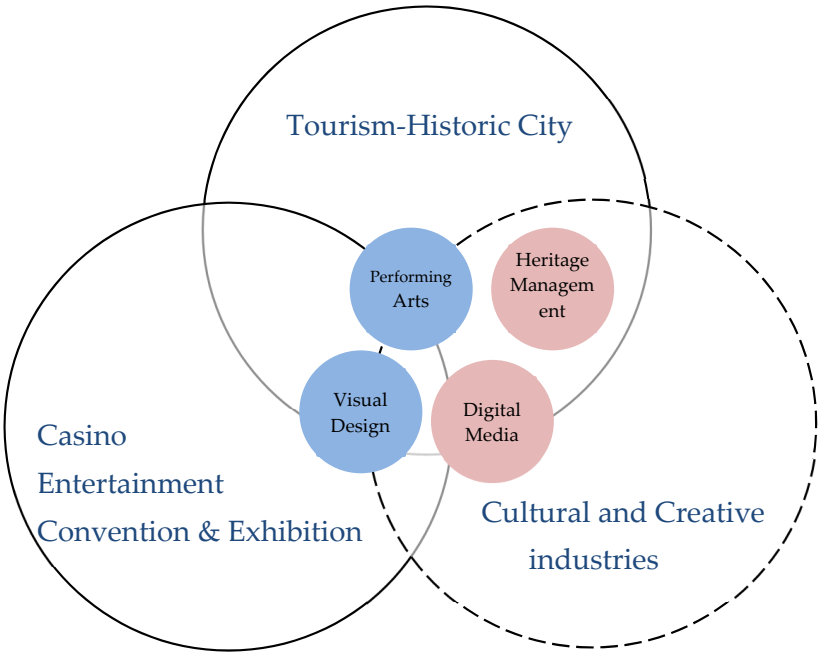

Figure 5. Development concept map of cultural industry in Macao.

The exhibition industry in Macao requires the design and visual arts industries to provide beautifying, value-added services, such as exhibition decoration and advertising poster output. Interior design can provide the exhibition venue layout and plan. Visual arts and design can provide advertising media, such as posters, brochures, and flyers. In addition, digital media can not only provide marketing and advertising on the internet for the exhibition industry, but also provide diversified media interactive services during the exhibition period. The performing arts can also enrich the content of the exhibition industry. The performing arts industry can be interspersed in exhibitions as entertainment programs, providing participants with entertainment options besides official duties, and improving the utilization of advanced equipment in exhibition halls.

The gambling industry in Macao is now gradually developing toward a broad gambling entertainment industry. In addition, the performing arts are also an important industry for the entertainment development of the gambling industry, and the staff cultivated by the performing arts can also be engaged in other relevant CCIs. Digital media, design, and visual arts are basic demands for the high-quality development of all industrial and commercial companies, and the gambling industry is no exception in terms of talent and industries in these areas. Design and visual arts provide beautifying functions, which supply services relating to interior and advertising design for the gambling industry. In addition, the digital media industry can improve the efficiency of commercial operations in the gambling industry. For example, the digital media industry can improve online booking and social media marketing systems for the gambling and tourism industries. The gambling industry can also expand its online business through the digital media industry. Moreover, although posited as a resistant force against 'casino capitalism,' some heritage projects are supported by revenue from the gambling industry, which also invests in other public amenities to fulfill the requirements of the Macao government [114,121].

In addition to the current booming tourism industry in Macao, improving the tourists' impression of the city through beautification has become an important topic in Macao. The development of the design and visual arts industries can provide services to meet the above demands in Macao. Besides gambling entertainment and historic city visiting, adding performing arts becomes an important tourism option for tourists, which enriches the visual feast for tourists under the differentiated management concept of the performing arts in hotels. Perfect digital media planning is also helpful for visitors to enable them to

check the necessary information before their trip and to establish a good first impression of the city.

In addition, by adding a heritage management unit, a closer connection will be established between CCIs and the tourism industry, and, to be more specific, one can include exhibition and performance venues for the CCIs via the reactivation of old districts. Furthermore, the tourism industry also enriches the tour options for tourists due to the activation application of old areas, which can provide more job opportunities for the local design industry and drive the development of the design industry through demand for landscape beautification.

Those five industries, including the clothing, pop music, film, animation, and publishing industries, with the lack of a complete industrial chain in Macao, are suggested to supply one segment of service in the industrial chain, or they are advised to focus on the establishment of the city image of Macao in the future. In addition, the current goal of these five industries is to develop and strengthen small cultural enterprises, rather than large-scale cultural industries. For example, Macao can act as a scene provider for the film industry to provide a rare Portuguese-style scene in Asia. Macao's unique designers can also provide niche design services to the clothing industry. Thus, the present goals at each stage for such industries are advised to be to develop and strengthen small-scale cultural undertakings, instead of developing large-scale cultural industries.

5.4. Summary

Based on the above discussion, a comprehensive table was developed as Table 2, which analyzes how to combine the existing industrial advantages of Macao with CCIs; thus forming the guidance and logic of the development of Macao CCIs.

Table 2. Development logic of CCIs in Macao.

CCIs \ Existing Competitive Industries		Tourism	Casino Entertainment Convention& Exhibition
Industries to be developed	**Design and Visual Arts Industries**	Beautify the urban appearance of tourist cities	1. Improve the effectiveness of advertising and marketing 2. Beautify the exhibition, hotel and venue layout
	Performing Arts Industry	1. Increase the selection of travel items 2. Extend the stay of tourists	Promote the entertainment development of the gambling industry
Industries that need to be added	**Heritage Management**	1. Evacuating a crowd from St. Paul to other historical spots 2. Revitalize the application of Portuguese ruins	1. The gambling industry supports the management and maintenance of heritage 2. Digital development improves service quality of Casino, Entertainment, Convention& Exhibition
	Digital Media	1 Provide visitors with the convenience of browsing the website, so that they will leave a good first impression of Macao 2 Enhance visitors' experience through digital media interaction	Improve the effectiveness of advertising and marketing

6. Conclusions

As a successful tourist city, Macao already has a basic audience-driving force. Therefore, developing cultural industries in the form of "audience-to-content" is fundamental logical thinking. Based on the above logical thinking, this research divides the development of Macao's CCIs into three categories: industries to be developed, industries without expansibility, and industries that need to be added.

Industries to be developed: the performing arts, design, and visual arts. These kinds of industries are closely linked to Macao's current competitive industries, such as gambling, exhibition, and tourism. Consumers go to Macao because of the beautiful landscape or excellent performances. The intensive development of performers and designers will contribute to Macao's driving force as a tourist city. In addition, the talents cultivated by these industries have a high degree of industrial penetration and will be adopted into a wide range of industrial and commercial enterprises. For example, performers and designers can drive the development of other CCIs in Macao through the B2B business cooperation mode. Therefore, these kinds of industries are more likely to-be-developed in the future.

Industries without expansibility: clothing, pop music, film video, animation, and publishing. Since these kinds of industries require a mature industrial chain and a large marketing system to deliver products to the audience, neither of these conditions is satisfied in Macao. As a result, these industries are not practical for Macao, which, due to the geographical restrictions, is still in the infant stage of industrial and commercial development. For example, in the clothing industry, the Macao garment factories have moved to the neighboring Mainland of China, so the clothing industry is lacking local manufacturing support. In the pop music industry, only the live performance sector is developing in Macao. The pop music industry has developed into a saturated commercial market in Mainland China and Taiwan, and Macao, being a small island in between, does not have much room for development in this field. The film industry's market is also heavily influenced by Hollywood and the surrounding Chinese mainland. Therefore, the local film industry in Macao lacks not only the marketing development space, but also the support of the relevant mature industry chain. According to the official statistics of Macao, the publishing industry has not yet developed into a mature commercial market. To sum up, for the planning of the abovementioned industries without expansibility, Macao should support and encourage them by subsidizing cultural undertakings. Macao should adopt the development of basic cultural construction as the main direction, rather than focusing on the key cultural industry development.

Industries that need to be added: heritage management and digital media. Heritage management promotes tourism as its main guide. It is an important planning project for Macao's cultural and creative industries to develop the "audience-to-content" industries. Digital media can help Macao break geographical restrictions and realize "content-to-audience" through the digital media system. Therefore, the combined development of heritage management and digital media is a basic requirement for the integrity of the Macao CCIs. Regarding heritage management, it should be managed by a unit under the Cultural Affairs Bureau. Currently, Macao has indeed established a unit related to the maintenance of cultural heritage. The focus of Macao's cultural heritage management development is to develop Macao's cultural heritage from a single scenic spot through in-depth planning and development into a series of points, lines, and even areas. With proper heritage development and management, the rare Portuguese-style buildings in Asia will surely achieve outstanding results in Macao. With respect to digital media, since current society has entered the digital age, digital media should be developed by any culture-related company. All cultural companies should develop digital media capabilities to promote Macao cultural products, which are limited by geographical restraints. Culture-related companies, for example, should focus on developing emerging communication platforms, such as social media and short videos. In addition, because of the B2B characteristics of digital media, it can serve a wide range of industrial and commercial enterprises to

enhance the efficiency of city operations. The Macao culture-related government units should emphasize the planning of the digital media industry.

Overlapping CCIs development reference of the Pearl River Delta, the existing conditions and resources of Macao are not as good as those of other Pearl River Delta cities. CCIs planning of many Pearl River Delta cities is based on sufficient land supply and abundant manpower, which is not the case for Macao. Macao should make good use of its existing tourism and gambling resources and integrate the development of these resources with cultural industries. By using planning methods that differ from those of other Pearl River Delta cities, Macao can develop CCIs with their characteristics.

This investigation has several limitations. Firstly, the research conclusion is drawn from two theoretical frameworks, which means that it is not based on pure reliable data studies, but an analysis of the description based on the subjective judgment of the author. In addition, due to the limitations of research time and paper length, the depth of the discussion on the eight CCIs is somehow limited. However, the results are still worthwhile in serving as fundamentals for broader research. For example, possible further research is advised to determine whether the current research results can be generalized to other casino cities. On the other hand, future studies could explore different combination modes of the gambling cities and their CCIs, which have the potential to help the transformation and sustainable development of gambling cities. Another meaningful prospective research in the future is to examine whether the three-circle interactive consumption model can be applied to gambling cities or other cities with unique characteristics to verify the applicability of the theory.

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Sustainable Development in Local Culture Industries: A Case Study of Taiwan Aboriginal Communities

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Abstract: Taiwan's indigenous communities have an abundance of unique cultures. Their service industries with local and foreign cultures have opened up distinct opportunities for sustainable development. Despite the enormous potential of aboriginal communities, particular attention should be given to ecology and sustainability. The traditional emphasis on craftsmanship and design is shifting to a new focus on the service industries and experimental design, which is not limited to the design of tangible products. Design concepts are now being applied to service industries that span several fields and are also being used to come up with systematic solutions for real-life problems. However, in the service industry, design experience must be used when introducing design concepts. The problem is how to shift from "High-tech" to "High-touch", for the aborigines are used to designing products at the usability level. This research proposes a model of experience design for use in aboriginal culture revitalization. Three different cases show how to apply the framework from experience design to local revitalization. Results show that the model can integrate the principles of sustainability into service industries and that it needs to be verified in future studies.

Keywords: sustainability; service innovation; experience design; revitalization; aborigine

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1. Introduction

Due to the COVID-19 pandemic, Taiwan's aboriginal communities will likely be slow in recovering in comparison with other sectors of the tourism industry. Thus, an important task in the post-pandemic era will be to allocate the resources required to effectively revive the service industry in indigenous communities [1]. The poorer parts of the world that are most vulnerable to climate change are also most dependent on the service industry as a foreign exchange earner [2]. Tourism is acknowledged as a tool through which communities can achieve the United Nations' Sustainable Development Goals (SDGs) [3]. Economic, socio-cultural, and environmental impacts influence residents' support for service industry development [4]. However, despite the huge potential of the rural service industry, special attention must be paid to ecology and sustainability [5]. Indeed, the increasing importance being given to responsible service industry development in recent years has brought significant environmental, social, and economic benefits to rural communities worldwide [6]. Taiwan is no exception, where there is growing interest in both ecotourism and the cultural service industry conducted in aboriginal communities. At the same time, many aborigines see the service industry as a more responsible and sustainable way to both showcase and preserve their culture and ecological resources [1].

Previous studies detected relative problems in cultural heritage such as degradation of local culture industries, weak cross-sectoral linkages, ecosystem degradation, and loss of place integrity [7]. Sustainability emerged as the dominant practical and operational issue, while integration at different levels was the greatest challenge to service industry research [2]. By integrating the theoretical research on design, this study proposes a framework of experience design for the service industry in aboriginal communities, presenting

case studies showing how it is to be properly applied. In this way, service innovation will replace the tools of those involved in various aspects of aboriginal culture and sustainability.

For most Indigenous peoples, "sustainability" is the result of conscious and intentional strategies designed to secure a balance between human beings and the natural world and to preserve that balance for the benefit of future generations. Aboriginal people are also a source of sustainability strategies that can contribute to our collective well-being. Through ongoing communication and an understanding of traditional and environmental knowledge, education for a sustainable future can be achieved. Some successful cases, such as those in Australia and the United States, have inspired this study [8,9].

In short, the common goal is: Achieving sustainable development and promoting development cooperation. That is the core value of this study.

2. Literature Review

For aboriginal peoples, sustainability results in benefits for future generations. The concept is applied to secure a balance between human beings and the environment. Aborigines are a source of sustainability strategies that can contribute to service industries. Through education and communication of service innovation, sustainability can be achieved. Some concepts of service industries are needed to be changed as follows.

2.1. From High-Tech to High-Touch

Davis [10] proposed the technology acceptance model, which takes usability and ease of use as the main factors of design. Much earlier, Louis Sullivan (1856–1924) addressed the slogan of "form follows function" which became an important principle for examining the feasibility of design. In Taiwan, the development of manufacturing progress includes three stages, from original equipment manufacturing (OEM) to original brand manufacturing (OBM) [11]. In the OBM phase, designers have begun to integrate the emotional aspects of user experience into product design. Consequently, emotional design has become a key factor in product innovation. Thus, the emphasis of design has shifted "from Function to Feeling", "from Use to User", and finally "from High-tech to High-touch" [12–14]. In discussing the respective demands of consumers and product designers, Lin et al. [15] argue that in the evolution of the cultural and creative industries based on the 4C model (Creative, Cheerful, Collective, and Cultural), the emphasis of consumers has gradually shifted from physiological needs to aesthetic experience, while the emphasis of product designers has gradually shifted from function to experience, and is now in the process of shifting to culture, a process in which the 4C model is taking on a twin stage consisting of humanities and technology, beginning with creativity, and proceeding to enjoyment, choice, and culture, as shown in Figure 1 [11,15].

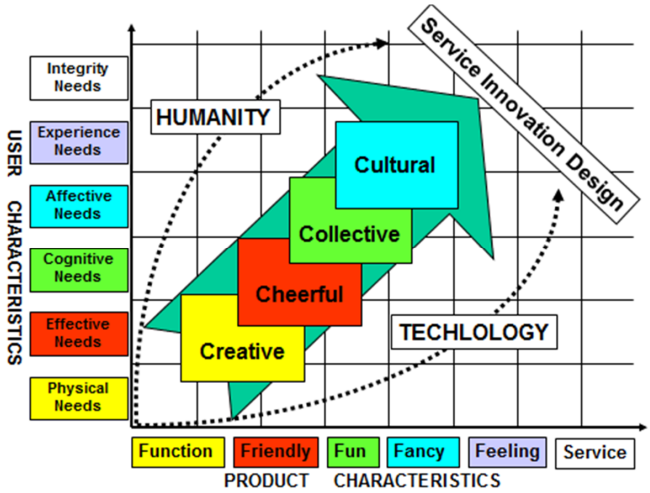

Figure 1. Framework of cultural creative industry's 4Cs. (Reprinted with permission from [11,15]. Copyright 2014, 2015 Lin, R. et al.).

Thus, due to the important changes in both consumers and manufacturers, increasing emphasis is being given to the emotional design stage of high-touch, aesthetics, and culture. Far from being limited to product design, this shift from high-tech to high-touch is also having a major impact on service innovation.

2.2. Local Revitalization in the Aboriginal Communities

Aborigines follow an understanding of the traditional belief system. In the aboriginal language, "Gaga", aboriginal ecological strategies advocate nature and human symbiosis that can contribute to our well-being in Taiwan [16]. The local environment can be used to increase interaction and understanding between locals and visitors [17], in the process of which local residents gain an enhanced sense of local identity. Moreover, local revitalization is multifaceted by nature and can include such elements as craft design, space arrangement, and service industry activities [18].

Sustainability has already become a vital development issue in aboriginal communities. It requires giving simultaneous consideration to the environment, society, and economy [19,20], since the benefits derived from each of these areas have a definite impact on a community's attitude toward development [4]. Service industries' development exerts mutual effects in economic, social-cultural, and environmental dimensions that change the host community's living experience [4].

Sustainable development can also serve as a practical stage for local revitalization, in that cultural heritage can become the driving force for sustainable development, and authenticity is a core value of culture [4,21]. Cultural exploration is the most important factor attracting tourists to aboriginal cultural festivals [22]. Sustainable development strategies are responsible for the historical-cultural context and the uniqueness of the community. Moreover, community-based approaches to development are the most effective and sustainable ones [23]. There are a variety of intangible elements of culture in aboriginal communities, including spoken stories, seasonal community activities, food, clothing, dance, way of life, and even memories [23].

For indigenous peoples, they follow their ancestors' ideas and have created a different lifestyle. As a result, many everyday items are very different from what we think. The culture of indigenous peoples and their artifacts are full of human nature, and how to add value through creativity, supplemented by elements of science and technology, both to preserve tradition and meet contemporary needs, is an urgent issue to be solved. In short: (1) From Function to Feeling, (2) From Use to User, and (3) From High tech to High touch (see Figure 2).

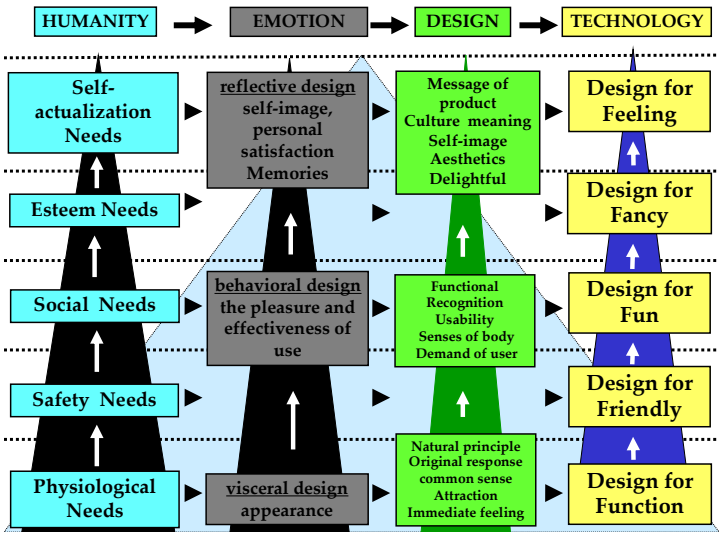

Figure 2. A framework of the relationship in humanity and technology. (Source: this study).

2.3. The Cultural and Creative Industries

Cultural product design is a process of rethinking or reviewing cultural features and then redefining them in order to design a new product to fit into society and to satisfy consumers with culture and aesthetics [24–26]. Hsu, Lin, and Lin [27] addressed a pattern for cultural product design which is (1) the idea is inspired from culture; (2) the idea must be formed into a product; (3) the product should be used in daily life; then (4) successes in branding are required, as shown in Figure 3.

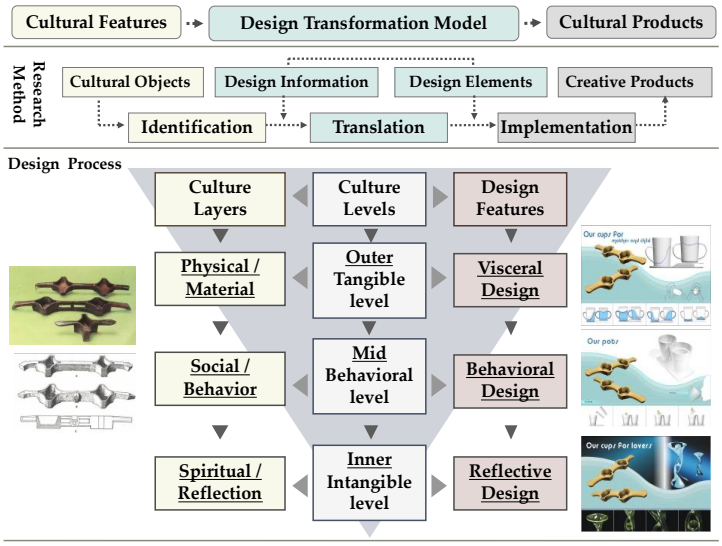

Figure 3. A model of the cultural and creative industries. (Adopted from [28]. Copyright 2016 Lin, R. et al.).

Hence, culture is the foundation of the cultural and creative industries, wherein cultural elements are creativity transformed into product designs that are integrated into daily life, finally establishing a brand image. In this study, culture is seen as a kind of way of life that groups people who have used a similar product and shaped a particular lifestyle.

Furthermore, Lin et al. [11,15] also proposed a model for cultural product design. Thus, the natural environment and local culture are the key elements of cultural products in the local service industry, wherein visitors engage in activities of local cultural rituals, in the process of which they gain a personal experience of the local culture [17]. Therefore, based on the previous studies [11,15,27], the cultural and creative industries are divided into a cultural phase consisting of nature and culture, and a production phase consisting of the creation of distinctive products relating to daily life, as shown in Figure 3.

2.4. Experience Design

Pine II and Gilmore formulated a model of the experience economy based on the value generated by economic activities, in which experience is regarded as a type of economic output, as well as an added-value commodity, such that the value generated by economic activities can be divided into four categories: commodities, goods, services, and experience [29]. The process by which a designer gradually transforms a text into a product can be said to consist of four steps: (1) setting a scenario; (2) telling a story; (3) writing a script, and (4) designing a product [25].

In the present study, "setting a scenario" is thought of as a process of turning creative inspiration into practical ideas; "writing a script" is thought of as the linking together of elements, which are arranged by the designer into a particular structure; and creative technology is used to shape these structured elements into a particular form. This study shows how the cultural and natural resources of the cultural phase can be extracted and used as components in writing a visual script on a particular theme. The resulting

experiential product is arranged in a perceptual context in such a way as to elicit a distinctive impression in the consumer, as shown in Figure 4.

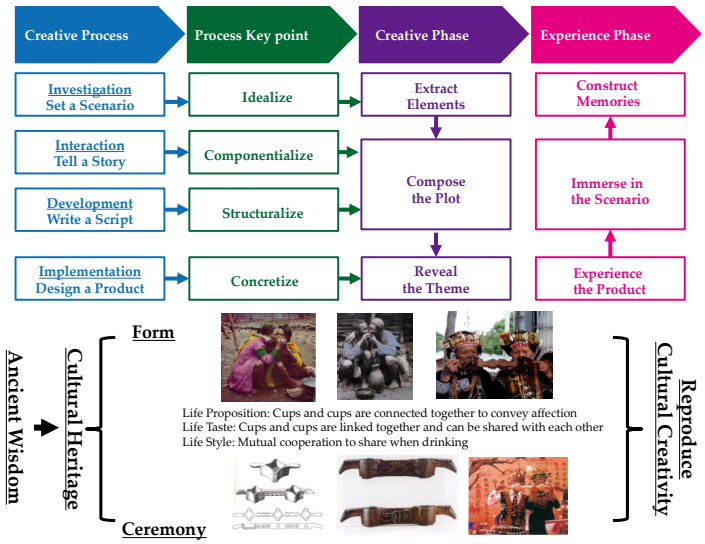

Figure 4. The stages of experience design. (Reprinted with permission from [28]. Copyright 2016 Lin, R. et al.).

2.5. Acculturation in Human–Culture Interaction

Acculturation plays an important role in cultural product design with embedded communication theory [30]. Communication is a process in which a message is encoded and conveyed via a particular medium to a recipient for decoding on various levels. In the case of a local festival, unanticipated and undesirable side effects include litter, noise pollution, traffic congestion, offensive behavior by tourists, and excessive commercialization, all of which tend to detract from the solemnity of what is supposed to be a sacred event. Even more problematic are external funding and the uneven distribution of the proceeds generated by the event, which can easily split a close-knit community into competing factions [31]. By contrast, in a sustainable approach to local development, equal or balanced emphasis is given to economic benefits, cultural preservation, and environmental protection [32].

In terms of culture, such an approach promotes the preservation and handing down of traditional skills, investing them with new values, both tangible and intangible, for residents and tourists alike [33]. Indeed, participation in cultural events is mainly motivated by the intrinsic value of the event itself, rather than by the pursuit of an instrumental value, such that authenticity is regarded as far more important than any entertainment value the event may offer [34]. Thus, one of the primary goals of local revitalization needs to be the preservation and handing down of local culture and traditional skills, as shown by the way in which the neglect of traditional culture or its inappropriate application often elicits a backlash from local residents. The past study appearance and physical settings of attractions were found to be the initial and most important indicators of authentic or inauthentic experiences. Other criteria for assessing the authenticity of heritage experiences include the presence of local culture and customs, constructed elements, commodification, and atmosphere [35]. In terms of economics, innovation is the key element for the feeling of freshness, all visiting the aboriginal sites are novelty-seekers in the aboriginal communities of Taiwan [36,37].

The media or agent by which the message of customer experience is transmitted can be staff, products, services, activities, or place, each of which has the ability to satisfy the consumer's requirements and to create a unique experience [38], which can be deepened and enhanced through the manipulation of sense perception and emotion, and by the use of the product itself. Past research has found that the main factors drawing visitors

to Taiwan's aboriginal communities are traditional architecture, handicrafts, traditional customs and rituals, and nostalgia for a bygone era [39].

As for the communication level, in his book *Emotional Design*, Norman [40] makes a detailed analysis of product design, in which he divides the creative design process into three levels: visceral, behavior, and reflection. For creativity, how to effectively communicate with local people, interest groups, etc., is a prerequisite for the subsequent series of work. Especially when it comes to indigenous peoples, it is necessary to further grasp the unique culture, customs, and lifestyles of indigenous peoples through communication. For indigenous peoples, their unique culture has created different ways of life. For designers, if they only look at the surface and draw conclusions, it is often easy to cause mistakes. Or rather, you cannot think in terms of past mindsets. Combining the above concepts and theories, this study further proposes a communication model suitable for cultural and creative design for indigenous peoples (Figure 5).

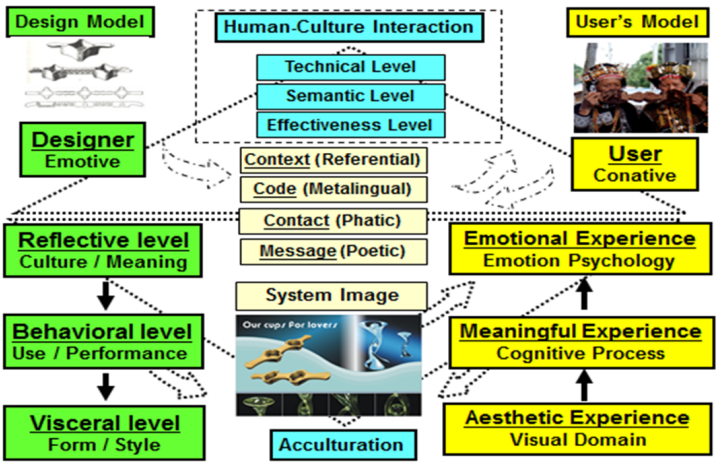

Figure 5. Acculturation for cultural and creative design. (Redraw from [30,41]. Copyright 2018 Gao et al.; 2009 Lin et al.).

3. Methodology

3.1. Conceptual Framework of Case Study

The case studies are suitable in the rich, real-world context in which the phenomena occur. The research question is broadly scoped, which gives the researcher more flexibility [42]. Moreover, the nascent theory proposes tentative answers to novel questions of how and why, often merely suggesting new connections among phenomena [43]. Hence, the study opted to explore the design context of indigenous culture sustainability development in the case study. The case study has more flexibility to cope with different villages' unique conditions.

Natural and cultural resources are the basis of the cultural and creative industries, and culture itself consists of the collective behavior formed by people interacting with and adapting to local natural conditions. The creative phase consists of extracting elements, writing a script, and presenting a theme. Next comes the communication phase, in which the designer can use either a formal or intentional approach in conveying his message. In a formal approach, the emphasis is on the use of local natural resources to convey a particular idea in the form of products, places, and festivals. In an intentional approach, the emphasis is on the use of communication and media to convey an abstract concept, such as creativity, authenticity, and sustainability. In the next phase, the designer brings his message to completion on the three levels of visceral, behavioral, and reflective. Once the message is received, the recipient processes it in terms of experience, emotion, memory, and impression. Next, the cultural and creative industry model is again used to present an actual product, one which relates to daily life, and thus has more significance for the consumer.

In the model, this study builds concentric circles on three levels which divide the cultural and creative industries, the experience, and the communication phase. In the outer

ring, this study uses the cultural and creative industries phase in the following way. Lin R. et al. propose four steps in inspiration from nature, forms culture, finds application in brand, and establishes daily life [28]. In the middle ring, this study uses the experience design phase in the following way. Lin et al. propose the following four steps: (1) setting a scenario, (2) telling a story, (3) writing a script, and (4) designing a product [25,28]. However, some elements' attributes are similar. So, this study simplifies some processes for the creation and experience phase. Finally, this study uses the communication phase following the inside ring. First, the communication phase divides into message, medium, and levels. The communication levels include visceral, behavior, and reflection from Norman. The communication medium includes ritual, workplace, and utensils [39]. The communication message includes authenticity, eco-friendly, and innovation [35–37].

In summary, this study combines several models obtained from the literature review, and then combines the motivation and goals of the research to construct the conceptual framework of experience design in local revitalization (Figure 6).

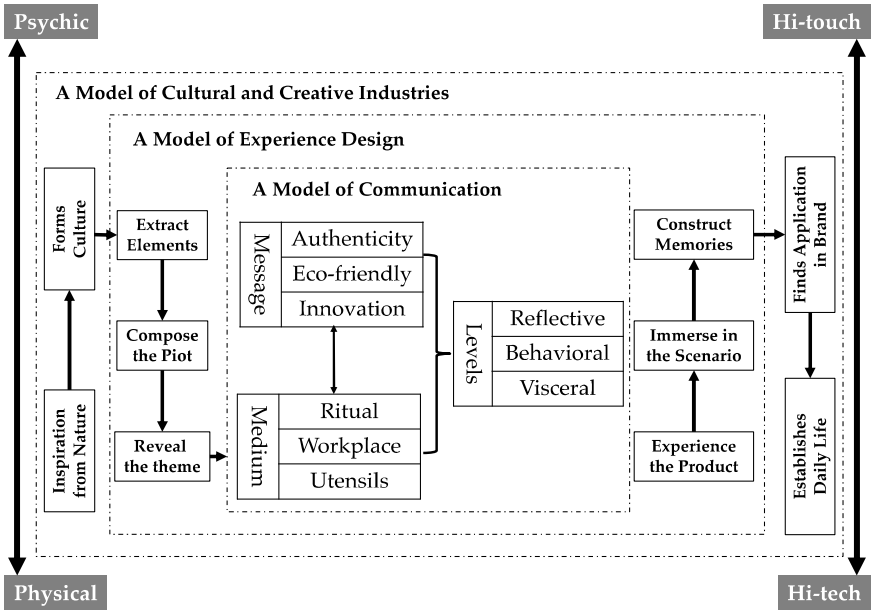

Figure 6. Conceptual framework of experience design in local revitalization. (Source: this study).

3.2. Overview of the Case

Despite ongoing outward migration and cultural erosion, Taiwan's aboriginal communities have managed to retain much of their distinctive cultural traditions, making them well suited for research on local revitalization. Taiwan presently has 16 officially recognized aboriginal tribes, all of which belong to the Austronesian language family. Among these, the largest is the Amis tribe, which is located on the eastern side of the island and whose members have traditionally made a living by fishing and agriculture. The Atayal tribe is spread out in the mountainous areas in the north and center of the island, and its members are noted for their skill in hunting and weaving.

The study opted for a case study approach to explore the design context of indigenous culture sustainability development. The case study has more flexibility to cope with different villages' unique conditions. This study is based on the medium element divided into three represented indigenous villages: (1) Ritual oriented is Fata'an village, (2) Workplace oriented is Raysina village, and (3) Utensils oriented is Ceroh village, all of which have sizable populations and have largely retained their cultural traditions.

So, the model presented in Figure 6 will be used to analyze the three villages and thus tap into the value of their cultural heritage and sustainable development.

4. Results: Case Analysis and Discussions

4.1. Traditional Utensils in the Village of Raysinay

Each of the three villages studied in this research emphasizes a different aspect of traditional culture. Raysinay (Shibi in Mandarin) gives special emphasis to the manufacture and use of traditional implements, especially textiles. This village is located in a deep river valley in a mountainous area.

In terms of the cultural-creative phase, the women of Raysinay are especially noted for producing textiles using traditional techniques and natural fibers and dyes. In terms of the creative phase, textiles serve as the extracted element; many Atayal textiles feature the "ancestor eye" motif, which serves as a kind of script; and the production of textiles using traditional dyes and techniques serves as the theme. In terms of the creative intension, visitors are shown how to make the dye by boiling local plants and given a chance to exercise their imaginations in making a tie-dye pattern, the final products of which are on display. In terms of the authenticity intension, visitors are shown how to collect natural ramie and how to weave it into rope, in the process of which they come to appreciate the wisdom and diligence which has been handed down through countless generations. In terms of sustainability intension, visitors participate in a sowing ritual and the collection of plants used for dyeing, thereby gaining insight into the traditional aboriginal emphasis on respect for nature and maintaining a balance between man and nature. In terms of the experiential phase, in the process of learning how to use local yams to prepare dye for tie-dyeing, visitors gain an understanding of the traditional Atayal belief system and mores (gaga), as embodied in the lore surrounding the ancestral eye. In terms of the production phase, inspired by the images created on the nearby cliffs by the movement of the sun, the villagers have created the Walkingsun textile brand, which features the primitive aesthetics of traditional Atayal motifs and dyes, as shown in Figure 7.

Creative Phase	Produce Phase	Communication Phase				Experience Phase	Industry Phase
			Innovation	Eco-Friendly	Authenticity		
Forms Culture Atayal	Extract Elements Costume Accessories	*Reflective* Ritual Workplace Utensils	Display Fashion Highlight Trait Self-Fulfillment Appreciated Together	Be Grateful to Land Grateful for Everything Pure Natural Back to the Prime	Ancestors' Wisdom Inherit Culture Traveled Though Time Conventional Method	Construct Memories Commemora te Ancestors	Finds Application in Brand Walkingsun
	Compose the Plot Ancestor Eye	*Behavioral* Ritual Workplace Utensils	Aesthetic Effectiveness Unique Style Immerse in Imagination Stimulate Creativity	Respect Nature Pray for the Harvest Wild Plant Esteem Origin	Follow Tradition Follow the Custom Experience in Person Local Collection	Immerse in the Scenario Gaga	
Begins with Nature Fiber Dye	Reveal the Theme Aboriginal Weaving	*Visceral* Ritual Workplace Utensils	Natural Dyeing Boiled Dyeing Dyeing Room Tie-Dye Pattern	Primeval Forest Seeding Ceremony Hillside Grove Vegetable Dyeing	Totem Knit Twisted Cord Wicker Workshop Natural Ramie	Experience the Product Yams Tie-Dye	Establishes Daily Life Primitive Aesthetics

Guest room featuring traditional textiles

Yam dye

Fabric featuring traditional Atayal motifs

Figure 7. Traditional utensils of Raysinay. (Source: this study).

4.2. Traditional Ritual in the Village of Fata'an

Located next to the Matai'an Wetland Ecological Park in the East Rift Valley, the Amis village of Fata'an (Matai'an in Mandarin) is named after a type of legume that grows on trees, which was once a staple for the village.

In terms of the cultural-creative phase, in traditional Amis society, before participating in the customary coming-of-age ceremony, men are expected to be skilled in both hunting and fishing. The Amis of Fata'an have long used a technique for trapping fish known as palakaw, which has become a focus of the local service industry. In terms of the creative phase, "hunting and gathering" serves as the extracted element; "fishing in the river" serves as the script; and "fish trapping" serves as the theme. In terms of the creative intension, visitors are shown how to make eating utensils out of betel leaves, in the process of which they learn about the traditional aboriginal division of labor by which big jobs are tackled with ease. In terms of the authenticity intension, visitors collect stones from the river and are shown how to heat them for use in cooking fish, a technique which has been handed down for countless generations. In terms of the sustainability intension, visitors are shown how to construct a traditional fish trap out of natural materials, including bamboo and tree branches, in the process of which they come to appreciate the traditional Amis emphasis on living in harmony with nature. In terms of the experiential phase, visitors learn how to use the traditional Amis fish trap, in the process of which they gain a deeper appreciation for the traditional wisdom of Taiwan's aboriginals. In terms of the production phase, the traditional fish-trapping and stone-cooking techniques are adapted into a distinctive brand emphasizing simplicity and harmony with nature, as shown in Figure 8.

Creative Phase	Produce Phase	Communication Phase				Experience Phase	Industry Phase
			Innovation	Eco-Friendly	Authenticity		
Forms Culture **Amis**	**Extract Elements** Fishing	*Reflective* Ritual Workplace Utensils	**Cooperative Learning** Co-Creation Life Innovation Unexpectedness	**Self-Contentment** Nature Conservation Low Maintenance Energy-Saving	**Trace the Source** Simple and Unadorned Inherit the History Revere Ancestor	**Construct Memories** Living Wisdom	Finds Application in Brand Fata'an
	Compose the Plot River Fishing	*Behavioral* Ritual Workplace Utensils	**Teamwork** Collaboration Natural Workshop Beyond Common Sense	**Self-Supporting** Moderate Degree Fishing Live Near a River Draw on Local Resources	**Explore the Origin** Original Flavour Inheritance Territory Historical Accumulation	**Immerse in the Scenario** Primitive FIsherman	
Begins with Nature Inland Wetland	**Reveal the Theme** Diking for Fish	*Visceral* Ritual Workplace Utensils	**Natural Tableware** Hand-Knit Primary Forest Betel Leaf Pot	**Set up Fishing Ground** Build Habitat Riverine Wetland Bamboo Tube & Wooden Branch	**Search the Stone** Stone Boiling Stream Bank Medical Stone	**Experience the Product** Palakaw	Establishes Daily Life Harmony with Nature

Traditional three-level fish trap

Utensils made of betel leaves

Traditional fish trap in the river

Figure 8. Rituals in Fata'an. (Source: this study).

4.3. Local Color in Ceroh

Also located in the East Rift Valley is the Amis village of Ceroh (Zhilou in Mandarin), which means "endless inflow of water." A huge footprint made by selectively removing rice stalks in a nearby paddy field was included in the popular film Beyond Beauty: Taiwan

from Above, placing Ceroh on the tourist map. In terms of the cultural-creative phase, the village is surrounded by open fields and clear-flowing rivers and is bisected by the Tropic of Cancer; the rich soil here is well suited for a variety of crops, and agriculture is an important part of the local economy and culture.

In terms of the creative phase, farming culture serves as the extracted element, the pristine natural environment serves as the script, and aboriginal agriculture serves as the theme. In terms of the creative intension, in addition to paddy art, the village is also known for its colorful festivals featuring traditional dance, all of which have made Ceroh a popular destination for domestic tourists. In terms of the authenticity intension, by participating in a traditional blessing ritual and by making a colorful "lovers' bag," visitors gain a taste of the ancient customs which have been handed down to the present day. In terms of the sustainability intension, visitors participate in the local harvest, thereby gaining an appreciation of the sustainable agricultural practices which have sustained the Amis for countless centuries. In terms of the experiential phase, visitors sample traditional Amis dishes served amongst the rice paddies, highlighting the village's natural farming techniques. In terms of the production phase, the village has launched the Mipaliu brand, highlighting a healthy lifestyle and the traditional Amis cooperative approach to farming, as shown in Figure 9.

Creative Phase	Produce Phase	Communication Phase				Experience Phase	Industry Phase
			Innovation	Eco-Friendly	Authenticity		
Forms Culture Amis	Extract Elements Plant Grain	*Reflective* Ritual Workplace Utensils	Enjoy Together Construct Relationship Relieve Stress Appreciate Together	Ecology Forever Sparing Consuming Symbiosis Back to the Prime	Return to the Hometown Deity Worship Reminisce the Past Promote Sence of Belonging	Construct Memories Non-toxic	Finds Application in Brand Mipaliu
	Compose the Plot Pure Food	*Behavioral* Ritual Workplace Utensils	Open Mind Group Interaction Relax Body Stimulate Creativity	Prevent Intervene Self Sufficient Natural Framing Cycle Utilization	Distant Source Tranquillization of Mind Long History Self-Identity	Immerse in the Scenario Rich Ground	
Begins with Nature River Rice	Reveal the Theme Aboriginal Farming	*Visceral* Ritual Workplace Utensils	Aboriginal Ceremony Dance with Other Dining in Footprint Field Colorful Rice	Original Farming Farming Harvest Natural Farmland Leaf Tableware	Etiquette of Life Chieftain Blessings Sacrificial Temple Lovers' Bag	Experience the Product Rice Food	Establishes Daily Life Healthcare

Local dishes served inside a footprint in a paddy field

Colorful rice

Lover's bag

Figure 9. The workshop stage in Ceroh. (Source: this study).

4.4. Discussions

Based on the model constructed in this study, economic, environmental, and cultural factors are examined in relation to sustainable development. In terms of economic factors, the focus is on using innovation to generate added value; in terms of culture, the focus is on using authenticity to create a sense of sacredness; and in terms of the environment, the focus is on using environmental awareness to generate a sense of connection with nature. The three aspects of economy, culture, and environment can be communicated through three different stages, viz., workshops based on economic and environmental considerations; rituals based on environmental and cultural considerations; and implements based on cultural and economic considerations, as shown in Figure 10.

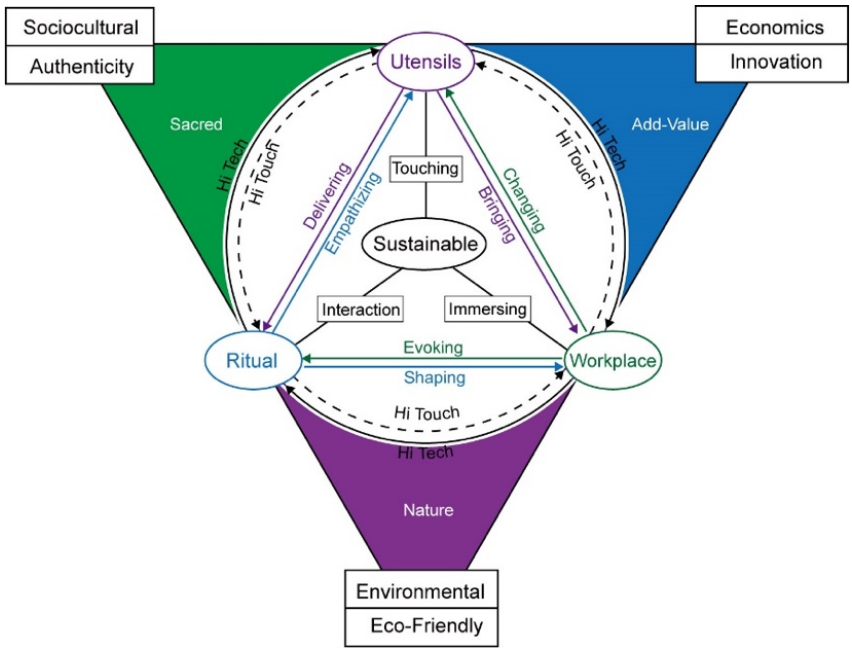

Figure 10. A model of sustainable experience design for local revitalization. (Source: this study).

It is believed that the local design elements originate from the indigenous people's lengthy culture and natural resources. Their designs are also in line with the aesthetic and experience needs of the current public to a certain extent. In using or viewing, people can better understand the culture and customs behind the objects. The indigenous villages developed different sustainable practices based on local natural conditions and unique culture. For example, (1) Atayal village has the best spinning and weaving in indigenous Taiwan because weaving is the key point in a woman's puberty rite. Hence, adult women need to be good at making a variety of life articles by themselves in Atayal villages; (2) Amis are the best fishers in indigenous Taiwan because they live around rivers and the beach. Therefore, they have developed a particular fishing ritual; (3) Ceroh village has flat topography and rich water, and later learned paddy farm skills from Hakka people. So, they excel in paddy farming more than other villages.

Regarding the role of the sacred in tourist experiences, this study argues that each ethnic group has its own unique culture and beliefs, many of which are mysterious elements. However, how the religious beliefs of the locals can be exploited as a tourist attraction is debatable. Sacred spaces and religion represent, from the tourist's point of view, a search for the authentic and an experience of the sacred. This is, then, tourism with spiritual connotations, which would alleviate the apparent ephemerality and lack meaning of everyday life [44]. The attitude of religious tourism in a sacred space is one of veneration and respect and seeks to have an experience that will put them in contact with the divinity and with a transcendental beyond [45]. The pilgrimage is now affected by new forms of motivation linked to the search for spirituality, authenticity, and cultural enrichment, resulting in new forms of tourism that provide an alternative to the traditional model [46]. It follows that when we talk about sacred spaces and tourism we must allow for different typologies of tourism; rather than confine ourselves to religious tourism, we must extend the field of study to other types, such as cultural or spiritual tourism [47–50]. For example, Richards [51] concludes that culture and tourism have a mutually beneficial relationship that can strengthen the attractiveness and competitiveness of local features.

In this study, indigenous culture is composed of many traditional mores and ceremonies. In addition, the long history and ancient myths have provided culture with strong sacredness. In indigenous culture, sacredness is primarily originally from nature's power and the souls of ancestors. In addition, the sacredness has a unique attraction and mystery for visitors' experience. When tourists take part in indigenous rituals, they recognize the

history and beliefs of indigenous language, dress, dance, and color. The attraction and mystery of sacredness for tourists is a burning question that requires an explicit and careful approach and deserves further study.

5. Conclusions and Suggestions

Based on the above case studies and discussions, the model constructed in this study can be used for further creative product development. Designing culture into products will become a design trend in culture industries. Product design has switched focus from usability and cognitive ergonomics to the affective aspects of user interactive experience. Therefore, this study is intended to study how to promote culture industries in the aboriginal community while nurturing sustainable development, the economic, environmental, social, cultural, and spiritual aspects of which were taken into account to balance three aspects of human–culture interaction. Case studies on three existing approaches to promoting products based on aboriginal culture are used to compare these three different design approaches, the results of which are used to construct a model of sustainable experience design for local revitalization.

In this study, three case studies are selected to verify the utility of the model as an approach to the study of culture industries and sustainable development. Due to differences in natural and cultural resources, each aboriginal village has adopted a different creative stage, which are named implement, ritual, and workplace, representing a shift from high-tech to high-touch as shown in the middle circle. In the implement stage, the emphasis is on physical contact with a particular object; in the ritual stage, the emphasis is on person-to-person interaction, mainly through meaningful normative behavior; and in the workshop stage, the emphasis is on the atmosphere conveyed by the place itself. Each stage has its own emphasis, and it is up to the designer to select the one which best fits the resources available in a particular local feature.

While each village needs to employ a variety of human–culture interactions to present what it has to offer potential visitors, it is also necessary to use a particular stage as the core value of sustainable development. Further studies are needed. For example, after the main stage is selected, the other two can be used in a subsidiary fashion to highlight the village's additional attractions. The designer might choose to emphasize high-tech functionality, bringing back memories with objects, and using implements to establish a connection with a place. For example, in constructing their traditional stone houses, the Paiwan tribe of southern Taiwan stack flat pieces of slate or shale in an arrangement which imitates the distinctive patterns seen on the hundred-pace snake—the tutelary deity of the Paiwan—and in laying the roof tiles of the same material, the larger pieces are used for the lower courses, and the smaller ones are installed higher up. Such traditional building techniques can be seen as a way of using the environment to evoke an emotional response. The aboriginal tribes such as Atayal, Saisiyat, and Paiwan have unique cultural features whose stages are better suited for different cultures that need to be studied in the future.

Relatively speaking, minorities or indigenous peoples have certain commonalities in the world, such as (1) the indigenous culture showing knowledge of human adaptation to different environmental conditions; (2) they belong to a relatively small minority in their countries or regions; and (3) their mystery and uniqueness attract more and more people. Therefore, we believe that the model of this study is an opportunity to be extended to other regions. However, since we are in Taiwan, limited to objective conditions, we can only take the indigenous people of Taiwan as an example to verify whether the relevant model is reliable.

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