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IJAD serves as a nexus for researchers, fostering collaboration and knowledge exchange across diverse disciplinary boundaries. We welcome original research papers and state-of-the-art reviews that contribute to the evolving discourse in art and design.

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The Influences of Contemporary Fashion to the Development of Men's *Baju Melayu* in Malaysia

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ABSTRACT

This study aims to analyse contemporary fashion influences that occurred in Malay men's *Baju Melayu*. Observations of modern contemporary *Baju Melayu* visual images from local designers were performed to identify the development of form, silhouette, colour, styling, and accessories. Analysis showed that the Malay men's *Baju Melayu* faces many changes in forms, silhouettes, colours, styles, and accessories in line with technological evolution, fashion openness, and the new lifestyle of the Malay men in Malaysia. The study hopes that local designers' new contemporary *c* approaches can still portray Malay identity and sustain it over time.

Keywords: *Influences, Contemporary Fashion, Malay Men, Development, Baju Melayu*

INTRODUCTION

The contemporary design of *Baju Melayu* has become a new trend used during cultural events and various activities. The role and function of clothing leads to a form of expression of a person's identity and social status (Hartati et al., 2020). Traditional clothing is one of the specific cultural characteristics of a society. In general, the function of clothing is to cover the body. It is then matched with accessories and unique features that distinguish the status and identity of one community from another.

The culture of tradition and modernity are two important concepts and have become the main direction of this research. In other words, the meaning of the culture is the determinant of society's values, beliefs, morals, and worldview. At the same time, modernization is a transformational social change in terms of impact and progress regarding the effects of the changes (Norazit, 1997).

Problem Statement

According to Yusmar (2009), the Malay community is dynamic and open, accepting the newness in their clothing. Modernising Malay traditional Baju Melayu is blended with selected elements to accommodate the current lifestyle context. As time progressed, modern fashion created a homogenous look resulting from less variety. According to Hoed (2002), the problem began when modernity and creativity faced stigma from customs and traditions, which halted the development of creativity without recognizing that the custom itself was a mixture of many cultures. Selected elements developed new designs to accommodate the current context, which may have involved a different interpretation of beauty (Hanisa, 2016).

To understand the development of new style and trend changes in modern contemporary *Baju Melayu*, visual images, and component analysis will deconstruct each design into more minor elements so that the changes in the visual text can be understood and recognized.

Research Objectives

Based on the objectives and problems discussed, the study aims to identify the elements and added value used in constructing the contemporary *Baju Melayu* today. The objectives of this study are:

1. To identify design elements and new added value in the manufacture of contemporary Baju Melayu in the modern era of Malaysia.
2. How the new element and contemporary design reflect the character and culture of modern Malay men in Malaysia.

LITERATURE REVIEW

The meaning of clothing can be explained by two different substances that are physical in nature where the material is involved. However, the second meaning is more spiritual, non-material concerning practices, beliefs, cultural traditions, and beliefs.

Malay Traditional Clothing: Baju Melayu

In early societies, clothing was associated with a material element that had its unique function, which gradually received changes because of the civilization process. However, according to Zubaidah (1994), the meaning of clothing is something that binds the body to control elements that can hurt the body from weather, protect the *Aurat* or dignity and provide comfort in movement. History explains that Malay clothing undergoes an evolutionary process through the influences received from civilised nations such as India, China, Arab, and Europe (Siti Zainon, 2009).

Malay traditional clothes for men are similar for every country, consisting of two popular types: *Baju Melayu Teluk Belanga* and *Baju Melayu Cekak Musang*. The *Baju Melayu Teluk Belanga* is also

known as *Baju Melayu Johor* because it has expanded in the state. According to Azah (1990), this costume began to be worn over a hundred years ago, in the days of Sultan Abu Bakar residing in Teluk Belanga, Singapore. At that time, the use of this shirt evolved and became the daily clothing of the Malay community there.



Figure 1. A Malay chieftain and his follower attired in a complete set of *Baju Melayu* with *Tengkolok* and *Keris*.

(Source: *Museum Tekstil Negara*, 2012)

Next, the *Baju Kurung Cekak Musang* is like the *Baju Kurung Teluk Belanga*, except on the neck, where it has a collar. This shirt was worn in Johor during the reign of Sultan Ibrahim ibni Sultan Abu Bakar. *Baju Kurung Cekak Musang* has an upright neck, and the front is covered by three, five, seven, or nine buttons. The neck shape of *Baju Kurung Cekak Musang* is thought to be influenced by Indian culture and the Middle East.



Figure 2. Original cutting of men *Baju Melayu Cekak Musang*

(Source: *Museum Tekstil Negara*, 2012)

The Development of Malay Costumes

The Malay costume also gains influence from society, culture, and religious factors, which is the most significant factor in the design of the Malay costume (Saliken, personal communication, 2018). Traditional costumes symbolise a nation's civilization, including the Malay community that considers traditional dress plays an important role that is valuable and respected (Siti Zainon in Fatimah Mohamed Anwar 2019). The development of the Malay costume began in the 14th century in the palace. This development thus made *Pakaian Cara Melayu* a continuation of the Malay way archetype that developed along with the golden age of the Malacca Sultanate. Culture activist, Siti Zainon (2009), said the concept of *Pakaian Cara Melayu* is proven by the design features of traditional Malay clothes that are accepted as among Malay cultural identity. The fact is that the official Malay clothing was built by the royal system. This is where if someone is dressed up completely, then these people are allowed to enter the castle.

Meanwhile, modernity or modernization is recently used to describe an old social process called social change. In other words, the concept of modernization is a social process that is closely related to economic development.

The Malays in Malaysia

Malaysia has a variety of uniqueness, especially in terms of cultural heritage (Norhasimah et al., 2014). Malaysia has become a unique country because of a clash of cultures that took place hundreds of years ago and is now assimilated as a Malaysian culture. The Malay community is the largest race in Malaysia, and based on Dani Ahmad (2010), Malay represents about 60% of the total population. The Malays distinguish themselves between religion and belief, which is Islam. The advent of Islam has brought significant changes in the Malay community's politics, law, economy, and culture (Izziah Suryani et al., 2012).

Social Culture Changes

Social change is a change in society that involves changes in a community structure or due to the development in its environment, such as changes in the population composition system, geographical conditions, social system changes, or changes in its social structure. In terms of language, the term social change is defined as a subject of change, transition, or switch (Kamus Dewan, 2007) and as described by Farley in Abd Rasid (2018); Al-Tanubi (1995); Kamus Dewan (2007) who defines social change as a change in behaviour patterns, social relations, institutions, and social structures at certain things and times. In addition, the term change is also defined as the difference between current and previous situations.

Social Culture in Malaysia

In Malaysia, the diversity of multiracial and religions has given this community a rich cultural diversity. Malaysia is a country that is very special in terms of its people and its communities. Malaysians who live in various ethnic backgrounds are divided into two primary groups, which are the Bumiputera and the non-Bumiputera. This is a fact of the historical process of growth and development of life and the government of Malaysia. Therefore, each race in this country inherits various forms and characteristics of social culture.

RESEARCH METHODS

The data collection method used in the study is qualitative, through the reading and observation of visual data on modern contemporary *Baju Melayu*. The selected design was used as primary data. All the designs were collected from websites and local magazines and compared to the traditional *Baju Melayu* to identify the new elements. The changes were interpreted using related theories supporting this study's findings.

Advances in technology, economics, education, and openness to styles and fashion trends have changed modern contemporary *Baju Melayu* in Malaysia. For example, the influence of neat designs, such as Western clothing has led to the commercialization of slim-fit *Baju Melayu*.

Theoretical Background

Adat in Malay Dressing

The Indigenous Malay community is concerned about the custom in their daily lives. The Malay custom expression itself pointed out that the tradition of wearing a Malay dress, which is “*adat memakai pada yang sesuai, adat duduk pada yang elok, adat berdiri tahukan diri*”. This Malay phrase describes what is necessary for orderly behaviour in a person's life, indicating that a person must put things in place, and the handle should behave accordingly. In accordance followed by the customary conditions as was emphasised in others Malay phrases, “*elok baju kerana sejudu, elok pakaian kerana sepadan*”.

At the same time, the religious beliefs of Malay practised Islam requires the Malay community to have a dressing style. The Malay should highlight their admirable attitudes and behaviour, show good self-personality was not damaging or degrade the Malay clothes they wear. Besides, there are also expressions of Malays customs that give advice, such as when wearing *Baju Kurung* should avoid being arrogant.

Malay custom expressions are explicit that the lives of the Malay people have rules in the affairs of dressing. They are cautious in determining the customs of wearing Malay styles, putting it on the high values of religion and culture of dressing. A few samples of the saying are as stated below:

“*Adat pakaian orang melayu, pantang mendedahkan aib malu: atau dikatakan:*

adat memakai pakaian melayu pantang membuka aib badan,

pantang menyingkap malu diri”

“*Apabila memakai tidak senonoh, nama rosak maruah pun jatuh”*

“*Apabila memakai membuka aurat, tanda hidupnya tidak beradat”*

“*Apabila memakai tidak sesuai, aib terdedah malu terburai”*

“*Apabila memakai tak tahu diri, kehulu kehilir orang mengeji”*

This assertion shows that before wearing the Malay traditional costumes, especially the Malays should not wear the costumes with any style of administration but should base on the intrinsic value of the form and culture of the Malay people. This is because all of them contained a piece of advice from the oldest Malay. These rules become a necessary dress code that everyone must understand and follow. This situation is clear that the Malay people are trying to choose clothes to suit themselves and their position,

try to wear clothes properly, keep from breaking the taboo in costumes, and show good behaviour in their daily life.

RESULTS & DISCUSSION

Analysis on the Development of *Baju Melayu*

Examples of the most well-known traditional *Baju Melayu* are shown in Figures 3 and 4. The classic *Baju Melayu* is built on a tube-shaped, loose-cutting silhouette. Most traditional costumes consist of a top shirt, waist (*samping*), and bottom piece of clothing (long pants).

The top shirt of a *Baju Melayu* is made using an easy-fit blouse with a traditional cut, which is sloppy and loose to the body. The classic *Baju Melayu* had loose, long sleeves with a length that ended at the wrist. A *Kekek* (similar function to gusset). This portion gives the arms a hidden influence. The *Pesak* is a panel with a geometric shape that, when put together, takes on the shape of a trapezium. The purpose is to increase body size and allow for a loose-fitting traditional *Baju Melayu* shape. Either *Teluk Belanga* or *Cekak Musang* is the shirt's neckline. Three pockets are on the top. Two different sorts of button styles are one button for *Baju Melayu Teluk Belanga* and five *Kancing* for *Baju Melayu Cekak Musang*.

In the meantime, the waistline and bottom portion were constructed in a rectangle-shaped pattern, starting from the waistline, and ending at ankle level. The long pants were worn at the bottom while the *samping* was worn at the top. In this era, the cut of the classic trousers is sloppy and below the ankle.

From commoners during the Malacca era, it was said that the materials used were cotton and satin with plain fabric. Meanwhile, songket woven fabric is usually only worn for royalties. In terms of accessories, the *Baju Melayu* is usually matched with headdress accessories which is a traditional headdress (*Tengkolok*), Malay cap (*Songkok* and *Kopiah*), and foot accessories which are traditional (Malay *Capal*), and Western formal shoes.



Figure 3. Traditional style for *Baju Melayu Cekak Musang*
(Source: Muzium Pahang)

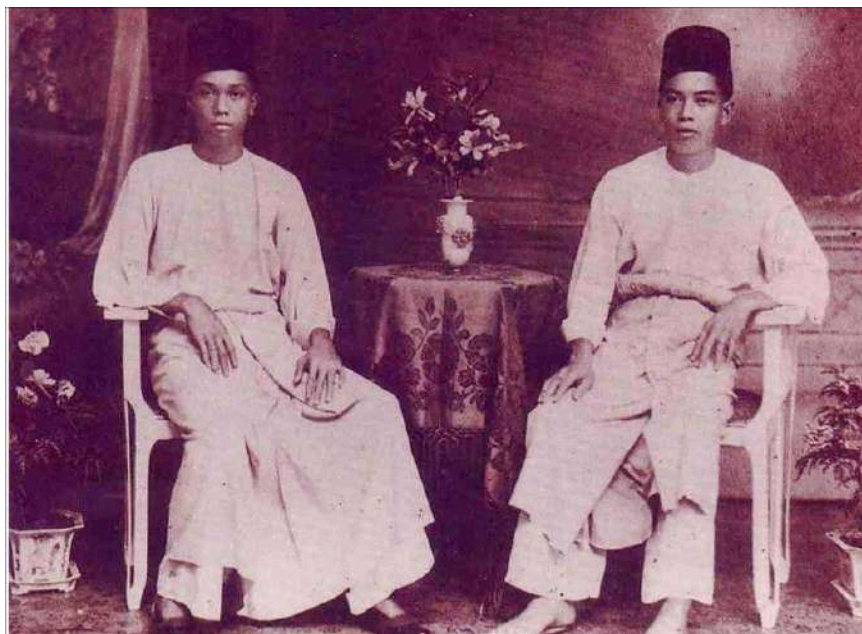


Figure 4. Traditional style of *Baju Melayu Teluk Belanga*
(Source: Muzium Pahang)

Comparison on the Development of Traditional and Modern *Baju Melayu* Style

Samples of modern contemporary designs of men's *Baju Melayu* were collected from fashion magazines and websites. All the images of modern contemporary men's *Baju Melayu* were collected from a random Malaysian fashion designer. The following main findings are based on the analysis.



Figure 5. Traditional *Baju Melayu*
(Source: Dewan Bahasa dan Pustaka)

Table 1. Visual Analysis of Traditional *Baju Melayu*

Component Analysis	Interpretation
<p>Silhouette</p> <p>The costume's silhouette (general shape) was more varied, loose, moderate, and fitted cutting shape.</p> <p>Style</p> <p>Top: Modern <i>Baju Melayu</i> is semi-loose cut</p> <p>Waist</p> <p>Accessories: The <i>samping</i> from <i>songket</i> and <i>Pelikat</i> sarong</p> <p>In terms of <i>samping</i> length, it becomes shorter.</p> <p>Bottom: The cutting of the modern pants is different from the traditional pants (baggy), where the pants are a cleaner shape and slimmer</p> <p>Head accessories: Malay cap/<i>Songkok</i></p> <p>Footwear accessories: Modern <i>Capal</i></p>	<p>The sleeve of the <i>Baju Melayu</i> worn by the Malay men during this period also slowly changes from a baggy sleeve to a straight semi-loose sleeve to the end of the wrist.</p> <p>Malay cap monopolised the whole trend of men's headdresses during the modernization era.</p> <p>The <i>Songkok</i> has gone through several modifications.</p> <p>The colour of <i>Songkok</i> is more varied, sticking with the black colour.</p>



Figure 6. Modern Contemporary Baju Melayu
 (Source: Saiful Sin)

Table 2. Visual Analysis of Modern Contemporary Baju Melayu

Component Analysis	Interpretation
<p>Silhouette:</p> <p>The costume's silhouette (general shape) was more varied, loose, moderate, and fitted cutting shape.</p> <p>Style:</p>	<p>Modern contemporary <i>Baju Melayu</i> is fitted cut without <i>Kekek</i> and <i>Pesak</i> and replaced by using a zipper either on the side of the body or the back of the shirt. The sleeve of the <i>Baju Melayu</i> also changes from a baggy sleeve to a fitted sleeve with a cuff.</p>

<p>Top: Modern Contemporary <i>Baju Melayu</i> is fitted cutting.</p> <p>Waist Accessories: The <i>Samping</i> from plain cotton fabric</p> <p>In terms of <i>samping</i> length, it becomes shorter.</p> <p>Bottom: Fitted modern western pants</p> <p>Head accessories: Malay cap/Songkok and modern haircut.</p> <p>Footwear accessories: Modern shoe</p>	<p>The design of this shirt cutting, known as <i>Baju Melayu Kemeja</i> comes with a more fitted cut and has a contemporary modern element on the shirt. As seen in the Figure above, this contemporary modern shirt cutting of <i>Baju Melayu Kemeja</i> can be categorised as smart casual clothing. It can be styled for various and different occasions.</p> <p>Elements of a contemporary on this modern shirt can be seen on the top of the shirt where it has a yoke, shoulder band, sleeve band, and button placket with a Nehru collar. For the pants, the cutting is based on the skinny cut with a pocket and zip.</p> <p>In terms of colour, this attire used dark colour, which is dark purple and matched with grey on the few panels on top of the attire to give attractiveness and masculinity to the wearer. The costume colour is dominated by dark purple, and the combination of grey on the shoulder band, sleeve band, collar, chest, and waistline were depicted by the Western scholar as emphasising wealth, courage, energy, joy, flamboyance, and the status of the wearer. The application of these colours makes the wearer look energetic and cheerful mood.</p>
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Figure 7. Modern Contemporary *Baju Melayu*
(Source: Zerry Zamri)

Table 3. Visual Analysis of Modern Contemporary *Baju Melayu*

Component Analysis	Interpretation
<p>Silhouette: The costume's silhouette (general shape) was more varied, loose, moderate, and fitted cutting shape.</p> <p>Style: Top: Modern Contemporary <i>Baju Melayu</i> Teluk Belanga is fitted cutting. Bottom: Fitted modern western pants</p> <p>Head accessories: Modern haircut.</p> <p>Footwear accessories: Western shoes.</p>	<p>Modern contemporary <i>Baju Melayu</i> is fitted cut without <i>Kekek</i> dan <i>Pesak</i> and replaced using a zipper on the side of the body.</p> <p>The sleeve of the <i>Baju Melayu</i> is fitted until the end of the wrist.</p> <p>The hipster <i>Baju Melayu</i> Teluk Belanga enhanced the fabric's surface on the front, which is fully adorned with the modern geometric motif with varieties of colour, which could enhance more sophisticated elements and versatility effect on the attire which is usually the men's festive attire mostly comes with plain colour. This modern outfit is matched with fitted pants with a pocket and zip as an opening for the bottom parts.</p>



Figure 7. Modern Contemporary *Baju Melayu*
 (Source: Bernard Chandran)

Table 4. Visual Analysis of Modern Contemporary *Baju Melayu*

Component Analysis	Interpretation
<p>Silhouette: The costume's silhouette (general shape) was more varied, loose, moderate, and fitted cutting shape.</p> <p>Style: Top: Modern Contemporary <i>Baju Melayu</i> is fitted and shortcutting.</p>	<p>Modern contemporary <i>Baju Melayu</i> is fitted cut without <i>Kekek</i> and <i>Pesak</i> and replaced using a zipper on the side of the body.</p> <p>The sleeve of the <i>Baju Melayu</i> is fitted until the end of the wrist.</p> <p>The collection of Sepetang Raya by Bernard Chandran also features <i>Baju Melayu</i> designs influenced by Mao's suit pieces. This modern outfit is</p>

<p>Waist Accessories: The <i>samping</i> from brocade with modern motifs</p> <p>In terms of <i>samping</i> length, it becomes shorter.</p> <p>Bottom: Fitted modern western pants</p> <p>Head accessories: Modern haircut.</p> <p>Footwear accessories: Western shoes.</p>	<p>matched with fitted pants with a pocket and zip as an opening for the bottom parts.</p> <p>The Mao suit is the Chinese version of a Western business suit. Initially, the Mao suit included baggy pants and a tunic-style button-down jacket with a flipped collar and four pockets.</p> <p>To make it linked with the current trend, the designer makes a few changes to this attire which is still applying elements of Malay clothing such as Cekak Musang collar, modern readymade <i>samping</i> as waist accessory, and for the bottom parts, this modern outfit is matched with fitted pants with pocket and zip as an opening and paired with western shoes. The overall look gives attractiveness, wealth, masculinity, and a modern lifestyle.</p>
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Based on the visual analysis, the adjustment made to the styles and trends on the development of new design modern contemporary *Baju Melayu* brings a new look to this attire. As shown in Table 1-4, all the silhouettes for the men's *Baju Melayu* are from tubular shapes. Meanwhile, in terms of styles and trends, facing a few changes. For example, the cutting from baggy and loose are changed to semi-fitted and fitted on the modern contemporary *Baju Melayu*.

The global trend has influenced changes in the local fashion scene where smart casual is applied to the *Baju Melayu* styling. Designers used the concept of the Western shirt, such as applying an armband, cuff, front button opening, and welt pocket, showing the openness of Malay men nowadays in Malaysia in fashion. The overall outlook is more stylish and acceptable. The costume's cutting and decorative elements looked modernised and referred to that period's dressing taste. The traditional elements are still visible and never put aside because the Malays' five pieces of dressing style were still maintained.

Several features of modern contemporary *Baju Melayu* attire can be identified. The main feature of modern Malay shirts is without *Kekek* and *Pesak*, as found in traditional Malay clothes. Modern *Baju Melayu* is slim loose shirt cutting. The modern festival *Baju Melayu* is worn with two (without *samping*) or three pieces (with *samping*). In addition, because the modern *Baju Melayu* has no *Kekek and Pesak*, found that most of these shirts are slim fit; cutting is added with zip extensions on the sides of the shirt to enhance the comforting sense to the wearer. This modern contemporary *Baju Melayu* has been modified to look more attractive and has its character through the cutting evolution.

Before the advent of modernity and the influence of hipster style in *Baju Melayu*, men's trousers are made with a straight cut and baggy style. However, in the modern and contemporary Malay style, many trouser suits were created with a slim cut to highlight the style of modern men's clothing. In addition, in traditional pants in ancient times, most of them had no pockets. This is because men's *Baju Melayu* has three pockets, and the trousers are worn inside the *samping*. However, for modern trousers and western-style pants today, from the data gathered, the researcher found it has an additional pocket on the side of the pants. This situation is noticeably different because most contemporary fashion designers have made changes where modern and contemporary Malay shirts are created with only one pocket on the chest or directly without the pocket on the shirt.

All these changes are often related to popular trends and are followed especially by today's modern generation. In the old days, the patterns, and colours that Malay men liked were simple patterns and

primary colours. However, today's modern Malay men also like to wear clothes with unique patterns and bright colours.

Regarding head accessories, the researcher concluded that using *Songkok* is very popular as a head accessory for Malay men in styling the *Baju Melayu*. However, the latest hairstyle in Malaysia can be considered one of the popular options because it can be seen in fashion magazines and on social media, the modern men's hairstyle that takes the trend of head accessories. The study also found that this trend's changes are closely related to the change of clothing worn by Malay men today. According to the local magazine editor Affifudin Omar (2012), fashion hair styling can make men look more sleek or smart and suitable to match with the modern and contemporary pieces of *Baju Melayu* nowadays.

Researchers summarise that the trend of footwear accessories for the Malay men's *Baju Melayu* in Malaysia can be divided into traditional Malay *Capal*, western-style shoes before modern *Capal*, and fashionable shoes and slippers today are the latest sandals. This is because the young group in the modern day has now been flooded with various brands and types of shoes for everyday wear or festival wear, such as loafer type, seen as the popular choice in today's generation.

CONCLUSION

Overall, the findings show the evolution and modification of Malay men's *Baju Melayu* in terms of style, trend, and development of cutting. The main style of the Malay men's festival costume in Malaysia is imitated and gets inspired by the Malay royalties, surrounding, and fashion tastes. When discussing modern styles, hipster elements are one of the significant sources of changing the Malay men's festival attire, especially on the *Baju Melayu*. Additional values like embellishment, cutting, and accessories occurred due to the current fashion trends of a specific time. We must recognize that fashion and trends will change over time.

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Exploration and Research on the Product Design Method of YangJiaBu New Year Woodcut Prints from the Perspective of Social Innovation

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ABSTRACT

This theme comes from YangJiaBu new year woodcut prints, one of China's intangible cultural heritages. Currently, cultural innovation is attracting attention in the development of the global cultural industry and also occupies an important position in China's cultural strategy, bringing new opportunities for the revival of traditional culture. However, this folk culture is facing complex status and development problems, and its development needs to be actively promoted by all forces. This study aims to better promote the cultural innovation of YangJiaBu new year woodcut prints and explore the design method and process of integrating it into daily use innovation. The research adopts fieldwork, interviews, literature research and case study methods, and thematic analyses. In conclusion, these studies will help to identify key themes from current cultural developments, sort out design methods and processes, and provide insights that will make the daily-use innovation of YangJiaBu new year woodcut prints more product-identifiable and innovative, add sources of inspiration for modern design and social innovation, and continue to maintain an important position and influence in the future for the inheritance and development of China's traditional culture.

Keywords: *YangJiaBu new year woodcut prints, Daily product design, Thematic analysis, Social innovation*

INTRODUCTION

Currently, the innovative application of traditional culture is receiving increasing attention in the development of the global cultural industry, bringing new opportunities for the revival of traditional Chinese culture. Successful design directions in the future will focus on committing to the sustainable development of culture while providing better social development and economic value (Zhong & Su, 2023). Intangible cultural heritage (ICH) is an important part of China's culture, and its innovation and sustainability are increasingly emphasised in national cultural strategies, as it is an important foundation for connecting national emotions and maintaining national unity (Xinhua News Agency, 2021). In fact, the term "ICH" was introduced as early as 1972 with the adoption of the UNESCO Convention for the Protection of the World Cultural and Natural Heritage (Gruber, 1972), and in 2003, the UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage explicitly defined intangible cultural heritage: "'ICH' refers to the practices, expressions, manifestations, knowledge, skills, as well as the instruments, objects, artefacts, and cultural spaces associated therewith, which communities, groups, and, in some cases, individuals recognize as constituting their cultural heritage."(United Nations Educational, 2003). In 2004, China became the sixth country to accede to the UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage; In 2005, the General Office of the State Council issued the Opinions on Strengthening the Safeguarding of Intangible Cultural Heritage in China and the Opinions on Strengthening the Protection of Cultural Heritage in China (China Government Network, 2007). The introduction and development of the definition of "ICH" has profoundly demonstrated the cultural significance and importance of ICH in the world, and at the same time, the decision-making of the Chinese government has also demonstrated the importance that the country attaches to ICH and the direction in which it is developing.

As the folk art carrier of Chinese culture, YangJiaBu new year woodcut prints are the first batch of intangible cultural heritages and treasures in China, which reflect the living environment, cultural beliefs and aesthetic interests of the common people in Chinese folklore, and they are the indispensable symbols of folk culture and cultural life in China. Thus, the protection and research of YangJiaBu new year woodcut prints is an inevitable social requirement to promote the development of folk culture and economic prosperity; the research on the cultural innovation of YangJiaBu new year woodcut prints is of great significance to the orderly inheritance and innovative development of Chinese folk culture. At present, YangJiaBu new year woodcut prints are facing the complex cultural status and new problems of development: cultural stagnation and conceptual repetition. This is not only a problem of the stage of cultural development, but also a problem of the relationship between people's mode of production and lifestyle at a deep level. These problems and the complex development process together constitute the main reason why YangJiaBu new year woodcut prints have gradually fallen out of favour in the current development. Moreover, although China has ushered in the national tide and national cultural confidence in recent years, many younger generations are still unaware of and uninterested in it, and the development of traditional culture still needs time to accumulate and active promotion. At present, the cultural innovation of YangJiaBu new year woodcut prints focuses on two main aspects: artistic innovation and practical innovation (Zhang, 2007). However, artistic innovation requires the cultivation of a large number of professionals with higher artistic qualities, and it is impossible to save the situation in the short term, whether in terms of manpower, financial resources or time; therefore, gradually restoring the commodity form of culture, promoting cultural innovation, and realising the horizontal development of multiple categories of cultural products are the current requirements of the times and innovation in cultural development. Enhancing the cultural protection awareness and cultural inheritance responsibility of the state and the public is an important development strategy and direction of the current Chinese cultural strategy. The development of culture will take on a new era and relevance in the context of meeting the strategic background of culture and national policies. In order to meet the requirements of the current era and diversified needs of life, focusing on the daily innovation of YangJiaBu new year woodcut

prints to better achieve the sustainable development of traditional culture provides a gap and opportunity for this study.

In order to better promote and strengthen the cultural development and daily-use innovation of YangJiaBu new year woodcut prints, the purpose of this study is to discuss the current product design methods and processes from the perspective of modern daily-use product design, comprehensively analyse its cultural characteristics and cultural levels, and then determine the design methods and processes for the incorporation of YangJiaBu new year woodcut prints into modern daily-use products. As research methods, this study will employ the field survey method, the interview method, literature research, and case study, and data will be meticulously summarised and analysed. The aims of this study are to examine the cultural background and traditional practises of YangJiaBu new year woodcut prints, as well as to investigate the innovative development of traditional culture from the perspective of the design field, based on previous research in folklore, history, sociology, anthropology, art and other multidisciplinary backgrounds. And secondly, to examine the contemporary product design process and methodology. Finally, combined with case studies and summaries, following the principles of cultural design, it provides insights into the design methodology of YangJiaBu new year woodcut prints combined with modern daily-use products, in order to add creative inspirations and sources for traditional cultural design and social innovation development in the future. This study has innovative significance to the cultural development and application practice of YangJiaBu new year woodcut prints, and this kind of research combining folk art from the perspective of daily use design is a thorough examination of people's demand for product design and self-lifestyle at the present stage, as well as the inheritance and preservation of historical and cultural heritage. It is conducive to the marketisation of products of traditional culture, and has the significance of inspiration and reference for the development of contemporary cultural innovation. At the same time, this human-centred thinking and cultural awareness attempts to interpret and shape a new character of daily use and the spirit of contemporary design, making the relationship between products and people clearer in the context of daily life. This symbiotic interaction and harmonious relationship is an important guarantee for the development and continuation of folk culture, as well as an impetus for reflection and innovation on the development of human civilisation and society, and allows the relationship between people and products to gradually return to a state of harmony and order, which is conducive to the healthy development and orderly inheritance of traditional culture.

LITERATURE REVIEW

YangJiaBu new year woodcut prints

In the history of Chinese folk art, Nianhua is a distinct form of painting that originated in China during the Han Dynasty. In 1984, Li Guangting began using the term "Nianhua" in his book "Xiangyan xieyi" to define it precisely. YangJiaBu new year woodcut prints originated in China during the early Ming Dynasty and flourished during the Qing (Tan et al., 1993). YangJiaBu new year woodcut prints have undergone a lengthy and complex cultural development process, incorporating numerous historical factors, national cultural factors, and social development factors, and have become China's "ICH" at the close of the 20th century. YangJiaBu new year woodcut prints are rooted in daily life of the common people, representing the cultural beliefs and aesthetic preferences of folk art, emulating the natural way of life, and depicting the common people's simple and gorgeous perspective on life. It is evident that social changes, changes in labour practises, and changes in lifestyle have had a significant impact on the evolution and development of traditional folk culture. Reviewing and organising the cultural background and traditional customs of YangJiaBu new year woodcut prints helps to comprehend and study this folk culture in the context of multidisciplinary fields such as folklore, history, sociology, and art, and to fully

comprehend its cultural evolution, artistic characteristics, and developmental laws, to realise the integration of design resources, and to contribute to the derivation of innovative design and exploratory research, which is both necessary and important in the early stages of design.

YangJiaBu new year woodcut prints have profound cultural heritage, its artistic style and cultural concepts are closely related to the concept of the rich daily life of the people and the traditional history of the national culture, it is a macroscopic cultural ideas engraved into the specific scenes and details of the folk life; it contains excellent and diversified cultural elements and design inspirations, and at the same time strongly embodies the symbolic and decorative art. indicating the flourishing regional national culture at that time. It is an important national cultural asset that has been created and accumulated by ordinary people over a long period of time on the basis of their lives (Bamo, 2008). In terms of artistic development, YangJiaBu new year woodcut prints have undergone very significant changes in artistic expression during various periods of history. It was rooted in the social background, scientific and technological development and labour relations of the time, and technological advances also influenced its cultural content and the technique of the work. The literature review reveals that the artistic evolution of YangJiaBu new year woodcut prints has occurred in several historical phases (Feng et al., 2005): (1) During the earliest period of the Ming Dynasty, the primary subject matter is deity statues, the composition is solemn and rigorous, and the colours are vivid (figure 1). (2) The stage of development at the close of the Ming Dynasty in which images of gods and living and working were the primary subjects. (3) The stabilisation phase of the early Qing Dynasty. The theme of auspicious ideas was added to the subject matter, and in the artistic style there was a preference for the use of contrasting colours of high purity, and the figures were more plainly styled. (4) At the end of the Qing Dynasty, the theme of YangJiaBu new year woodcut prints was increased to include current affairs related to the political situation at that time, the artistic style was simple and generous, and the technique was more mature. (5) In the early stage of the Republic of China, when the society was in turmoil, the themes of YangJiaBu new year woodcut prints were mostly of the gods and goddesses, which soothed the traumas of the ordinary people at that time and provided them with spiritual solace. (6) After the founding of New China in 1949, YangJiaBu new year woodcut prints entered a stage of rest and recuperation, with realistic themes containing political significance as the mainstay, and the works are simple, with popular and generous images. The process of artistic development of woodcut prints in YangJiaBu provides a rich source of results and historical research for cultural innovation and discussion. The continuous and in-depth study of traditional culture reflects the increasing awareness of Chinese culture, and at the same time clarifies decisions and attitudes towards cultural development. However, despite the fact that the heat of research on traditional Chinese culture has continued to rise in recent years, and literature studies from both domestic and foreign countries have helped this study to understand the development of traditional new year woodcut prints from multiple disciplines and perspectives, the study of folk culture is still dominated by cultural preservation and protection. Among the data from China National Knowledge Infrastructure(CNKI) statistics, the fine arts profession occupies 45%, and the remaining main focuses are education 4%, culture 4%, tourism 3%, light industry 3%, cultural economy 2%, and industrial economy 1%. The research on YangJiaBu new year woodcut prints has expanded its channels and summed up its findings in accordance with the active research of multiple disciplines. Continual in-depth analysis and compilation of these studies can yield historical information and classified commentary on YangJiaBu new year woodcut prints. However, in the face of the current cultural strategy and stage of cultural development, YangJiaBu new year woodcut prints need to develop cultural innovations, especially practical innovations. Promoting its cultural innovation in the field of product design will play an important role, and there is still little literature that systematically develops the daily innovation and application of YangJiaBu new year woodcut prints by design method. Therefore, by combining the cultural development of YangJiaBu new year woodcut prints with regional cultural customs, conforming to the scientific theory of cultural evolution, and combining cultural hierarchy analysis (Leong & Clark, 2003), Cultural innovation and methodological exploration in the context of contemporary lifestyles can provide a theoretical basis and new design thinking for YangJiaBu new year woodcut prints.



Figure 1. Door gods, Qin Qiong and Jing De, Ming Dynasty.
(Source: Author's collection)

To sum up, in the long social and cultural progress and historical changes, the theme and elements of YangJiaBu new year woodcut prints have also changed continuously. YangJiaBu new year woodcut prints, as a folklore cultural product, contain a profound and systematic process of cultural development and characteristics of artistic evolution, both from the historical point of view and from the modern point of view; whether in the composition, theme, colour and image of the expression is very elaborate, and truly express the It truly expresses of people's customs and habits, thoughts and feelings, lifestyle, aesthetic point of view and other aspects of the needs. Therefore, the review of YangJiaBu folk culture, combined with the analysis and discussion of scientific theories, will be conducive to the contemporary cultural development and practical innovation of YangJiaBu new year woodcut prints, which will have theoretical significance for the increase of creative sources of culture and the expansion of folk culture research, and will have important inspirational significance for the innovative development of the society.

Intangible cultural heritage and design principles

The famous scholar Bernal has said that China has been one of the great centres of human civilisation and science for many centuries (Lin, 1984). China's intangible cultural heritage has diversified cultural identities and cultural values based on its history and culture, and has added commercial value and impact. Currently, under the policy of protection and development of ICH, China is vigorously promoting the integration of ICH into the cultural and creative industries. As defined by Culture UNESCO in 2003, the cultural industry consists of cultural products, cultural services and intellectual property. Integrating traditional culture into modern cultural innovation and product design to promote the development of cultural industries is also an important direction for China's cultural heritage and social innovation and development (Bao, 2019). Excellent traditional culture has accompanied China's transition from an agrarian civilisation to an industrial civilisation and a modern civilisation, and in the development of the modern market economy, it has gradually condensed and given economic connotations and functions.

In the study of cultural development and innovation of ICH, the principles of cultural design should be in line with the principles of aesthetics, inheritance and practicality (Zhang, 2021), and at present, in the process of the revival of traditional culture and the development of related industries, the principles of innovativeness, humanisation and sustainability in design are also gradually affecting the direction and development of cultural innovation (Mokhtar & Deng, 2014).

In this study, the cultural innovation of intangible cultural heritage focuses on daily-use innovation design, and the practical innovation research on YangJiaBu new year woodcut prints is necessary and in line with the development requirements of the times. Modern design translates traditional culture, combines folk cultural characteristics, humanistic values of handicrafts and aesthetic values, realises design empowerment of folk handicrafts, and makes them gradually adapt and integrate with contemporary lifestyles in daily-use product design with rich categories. Following the design principles of ICH and deepening the exploration and research of design methods and processes will provide systematic methodological guidance and theoretical basis for the orderly inheritance and innovative development of ICH.

Daily Products and Product Design Methods

Daily product design is different from product design in the broad sense. Since ancient times, daily product design has been based on daily life, its design is fundamentally to serve the public, ease of use, and convenience are also its distinctive features, containing practical and simple functionalism and design wisdom (Luo, 2021). The Chinese "way of using things" is embodied in all aspects of daily-use products and lifestyles, fully demonstrating the harmonious thoughts of China since ancient times on the interaction among people, things, and the environment; "making the best use of things" is the philosophy of life for products handed down in China. It embodies the Chinese people's understanding of the proper use of products, including the natural unity of form and function.

As a category of products, daily-use products possess the fundamental characteristics of products. Moreover, it is the product category with which people have the most contact during their daily activities, and it emphasises the close relationship between people and objects when they interact, which is the essence of daily-use design. The primary manifestations of daily-use product design characteristics are the functional, erotic, and cultural characteristics of daily-use products. Along with the development of the cultural innovation industry and the continuous change of people's lifestyles, daily-use products closely related to people's lives are firstly integrated with new cultures and life values. Today, daily product design still has a significant change trend and room for improvement, China's daily product market updated very fast, including the update of the category and the update of creativity, and this mode of mass production necessitates the cultural precipitation of the product and people's reflection on life. Therefore, for the innovative development of daily use of YangJiaBu new year woodcut prints, it must be integrated into the people's lifestyle and the frequent use of daily necessities, and the design essence of the daily use innovation of this traditional culture is the process of constructing the mapping relationship from perceptual imagery to shape features (Lin, 2007). It will help to shift the local traditional culture towards product marketability and contribute significantly to social innovation and economic development; and it is crucial for cultural preservation and promotion, fostering practical innovation and sustaining the cultural development of woodcut prints in YangJiaBu.

As it has been incorporated into product design, culture has gone through stages of constant integration and development. Modern product design has accumulated numerous scientific design methods as it has matured. In 1962, the Imperial College of Science and Technology in London hosted the "Conference on Design Methods"(Langrish, 2016), which inaugurated the Design Methods research field in academia. The development and research of design methods have progressively become the academic tradition of design research through continuous enrichment and development (Gerriker et al., 2017). Research on product design methods for culture tends to discuss design theories at the humanistic level, based mainly on feedback and reflections made by design thinking. According to Jiang (2010) the different design thinking can be divided into several different methods: design method based on image thinking, design method based on logical thinking, system design method, intelligent design method. For the methodological system of cultural transformation, it is elaborated in four dimensions: constitutive

form, cultural level, cultural environment and cultural function (Zhu & Luo, 2013). Regarding the research on product design methods, a study has summarised and concluded 538 design methods, including 68 industrial design methods, based on the research on Universal Design Principles, Universal Methods of Design, and Delft Design Guide: Design Strategies and Methods (Hu & Mi, 2022). In addition to the study, there is a compilation of product design methods compiled by the researcher, totaling 69 methods (Zhang et al., 2020). The study of design methods revolves around the design process, which according to Best (2006) is "a specific series of events, actions or methods". Based on universal design, he delineated "standardised processes" and "customised processes" to match the specific requirements of a design task or design activity. Since then, the "Double Diamond Model" has emerged from analysing design methods based on design practices (Kochanowska & Gagliardi, 2022). In addition, a study summarised the general process of combining traditional culture and product design through more than 1,100 related documents (Cheng et al., 2022). In conclusion, the product design methods and processes rely primarily on brainstorming, questionnaires, or interviews to collect the characterization of the user's description of the cultural characteristics or the confirmation of the artistic generalisations, combined with the data collation or intelligent design to classify and organise the culture; at different stages of the design, different design methods are employed to avoid both too subjective methods and too mechanised methods.

Concurrently, research and compilation are conducted alongside several domestic and international application cases of culture and product design. Some of these studies isolate and design the development of traditional cultural elements by combining Kansei engineering with the semantic difference method (Boddy, 2016). There are studies on cultural multidimensional profiling by the morphological matrix method (Deng et al., 2018); there are also studies on factor coding by genetic algorithms to construct regional cultural maps and design them (Wu & Han, 2022). In addition, some researchers use a combination of several methods, such as there is a study based on F-AHP and entropy calculation to extract elements from images, and construct matrices for extrapolation and validation (Hu et al., 2021); there is a study that uses perceptual engineering combined with symbolic derivation to develop cultural product design (Kang et al., 2022), etc. Innovative explorations in design applications include research in the areas of visual, packaging, product, and apparel decoration (Lyu & Yang, 2015; Gao, 2016; Zhao, 2021; Liu & Yang, 2022).

For the selection of methods at different stages, it can be seen that an increasing number of researchers will combine data classification or hierarchical analyses with engineering-type or combinatorial design methods, which are typically combined with intelligent design methods. Regarding the outcomes, these methods will quickly generate a large number of alternatives, but further screening and adjustment are required for the matching and integration of effects and aesthetics, and the design expression and presentation cannot be discussed and arrived at by relying solely on quantitative algorithms, and the design creativity stage is crucial for realising cultural extraction and design translation, and the design process. The design process and expression are ultimately driven by emotion and intuition (Toyong et al., 2021). Relying on the designer's expertise and experience, and combining it with a subjective level of understanding and cognitive gaps in cultural identity, the final design translation and design outcome is realised. The subjective creative ability and professional skills of designers play a significant role in the entire design process, which has a positive impact on an innovative significance for the combination of traditional culture and product design; at the same time, it requires designers to continuously improve their level of cultural understanding and innovation and to combine the characteristics and connotations of traditional culture with the design process. Generally speaking, the starting point and expectation of this study is to combine the cultural characteristics of YangJiaBu new year woodcut prints with the complexity of people's lifestyles from the perspective of modern daily-use product design, to summarise the suitable cultural dimensions and design points, to provide insights into the method of integrating YangJiaBu new year woodcut prints into the modern daily-use product design, to help and promote the cultural innovations of YangJiaBu new year woodcut prints, and to "reacquaint"

the public with modern daily use development of YangJiaBu new year woodcut prints. Make the daily innovation of YangJiaBu new year woodcut prints more product identification and national culture innovation, in order for the future of Chinese traditional culture inheritance and development to continue to maintain an important position and influence, as a means of ushering in new development and opportunities.

METHODOLOGY

The overarching concept of this research is founded upon the artistic components and traditional practices of the region. It aims to reflect the artistic development and conscious expression of cultural subjects, as well as to disseminate culture through artistic experience, cultural accomplishments, and cultural thoughts, so that local folk art may be better comprehended and developed through the implementation of cultural innovation and design practice. This study analyses and collects data via qualitative research methods, including fieldwork, documentary research, interviews, and case studies. Then, thematic codes can be identified and obtained via thematic analysis, and hierarchical induction and summarization can be performed to categorise the design processes and methods of commonplace products. In conclusion, this paper offers a comprehensive analysis of the design challenges encountered by YangJiaBu new year woodcut prints during the present phase of cultural evolution. Furthermore, it explores novel approaches and design methodologies that can be implemented to incorporate these images into daily-use products. The overall research procedure for this research is depicted in figure 2 below (Figure 2).

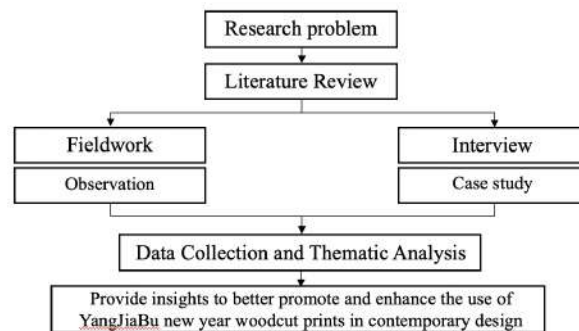


Figure 2. Research Progress

Fieldwork

Conducting a comprehensive examination of YangJiaBu Village, the YangJiaBu Museum, and Folklore Garden to gain insights into the industry customs and cultural landscape of YangJiaBu new year woodcut prints; integrating historical analysis to compile and synthesise artistic expressions and cultural practices that are unique to the region; and utilising observation and interviews to synthesise the present cultural challenges and state of affairs in Yangjiabu. This research process contributes to the comprehension of the regional culture's present trajectory of innovation and development, investigates and selects design methods under cultural attributes and principles, and is inherently motivating and pertinent for forthcoming inventive implementations and design methodologies involving modern everyday commodities.

In-depth interview

In-depth interviews were conducted with 10 daily-use designers to obtain valid data on current design in business activities, especially design processes and methods in modern design production, to advance the better integration of YangJiaBu new year woodcut prints into modern daily-use design and innovative applications. The interview population for this study will be sampled in quotas based on level of expertise and design experience. To increase the realisability of the innovative applications of this study, the interviewees were asked to be already experienced designers. The designers were categorised into different tiers based on their professional experience, which were junior designers, senior designers, and high-end designers. Moreover, designers at the senior level and above are usually also corporate managers or design directors, which will be conducive to examining the design process and methodology from a holistic perspective of new product development and enhancing the business perception and multidimensional thinking of this study.

RESULTS AND DISCUSSION

Fieldwork on YangJiaBu new year woodcut prints

Using historical analysis and fieldwork, this study aims to augment comprehension of the cultural attributes inherent in YangJiaBu new year woodcut print, fortify the internal cultural link with daily design, bolster the capacity for cultural transformation, and broaden the scope of knowledge regarding YangJiaBu new year woodcut print. The systematic comprehension of intangible cultural heritage is enhanced, thereby bolstering the daily influence and perception of traditional folk culture in the port and providing more comprehensive information and guidance for the application and combination of contemporary daily design(Figure 3).



Figure 3. The author discusses the woodcut design process with Yang Futao (left)The author learned woodcut printing from Yang Chunmei(right)

(Source: Author's collection)

This field survey provides some guidance and direction for the development of cultural innovation in YangJiaBu new year woodcut print. First of all, the cultural development of YangJiaBu new year woodcut print can work together and make efforts from both artistic innovation and practical innovation. Besides the cultivation of cultural skills in artistic innovation, the development of practical innovation is imperative to obtain the diversified and sustainable development of culture and to realise natural and

orderly cultural articulation and innovation. At the same time, at the current stage of cultural development, even though cultural innovation has taken off, there is still the dilemma of the descendants of cultural inheritors not wishing to continue in the relevant professions.

Furthermore, within the context of YangJiaBu's present economic progress, the cultural sector possesses the capacity to effectively steer regional industries towards advancements in cultural innovation. YangJiaBu new year woodcut print is an annual cultural event that takes place from the onset of spring to the conclusion of each year. This coincides with the village's traditional practice and the collective awareness of the New Year print industry. Chinese folk culture and traditional practices have consistently been shaped by the ethical order and harmonious perspectives on people, things, and the natural environment that originated in YangJiaBu Village. YangJiaBu Village's social and humanistic order has been shaped and standardised by these traditional practices, which have also had a profound effect on the cultural attributes of the village's literary and artistic creations. The continuous optimization, adaptation, and cultural sensitivity that permeate the market effectively direct the commercial development, adjustment, and maturation of the regional economic structure. Economic value has been elevated to the forefront of cultural value in the current new form of cultural consumption, which has become an integral component of economic development. For instance: the correlation between design development, economic progress, and cultural sustainable development; the association between traditional craftsmanship and business operations and more volatile economic models and cycles of cultural value; challenges associated with the management and profitability of small cultural enterprises; the enhancement of individual competencies and the expansion of an engaged consciousness regarding the exploration of cultural worth. An investigation into the cultural attributes of New Year woodcut prints from YangJiaBu will contribute to the growth of the cultural innovation sector.

Finally, for the protection of intangible cultural heritage and the promotion of industry and culture, design development is a very effective means of inheritance and innovation that can effectively promote and realise the sustainable development of culture and guide the direction of subsequent cultural innovation. This survey summarises six groups of terms related to the cultural development of YangJiaBu new year woodcut prints under the current stage (see Table 1), which helps to makes this study essentially intervene in the cultural innovation of YangJiaBu new year woodcut prints, and provides pre-cultural resources and data support for the integration of traditional culture into the design process and methodology of new product development.

Table 1. Related topics

Practical innovation	Cultural heritage	Craftsman skills	Cultural consumption	Lifestyle	Business model
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Design processes and methods of daily products

Sato has pointed out that generic theories and methodologies resulting from general design research are not directly applicable to design practice, but they provide frameworks and models for further research to develop domain-specific knowledge and methodologies that apply to actual design projects (Poggenpohl & Sato, 2009). Conducting a comprehensive review on product design and development will facilitate a more methodical examination of the design process and methodologies employed in this research. Nevertheless, product development and the emphasis on particular cultural resources must be grounded in tangible cultural phenomena and regional attributes. Conduct evaluations and assessments regarding the present phase and objectives of the design, rather than being constrained by the development process in isolation. By adopting universal standards, the implementation of new product development for traditional culture can be enhanced in terms of effectiveness and precision. Moreover, this approach facilitates the future realisation of sustainable cultural development and innovative design.

This study conducts in-depth interviews with ten daily product designers and is predicated on the innovative transformation and product application of regional traditional culture, as well as on current actual business activities and product project development. The interview primarily centres around the most recent advancements in everyday products. Methods and processes of actual design are described, along with a synopsis of key points.

By identifying the data gathered from the interviews via thematic analysis, the present state of design processes and methods utilised in the daily development of products was validated. In the end, the information pertained to several design relationship aspects, design development types, design processes and methods, and product characteristics. To begin with, the data indicates that the design relationship affects not only the design purpose but also project ownership, risk proposition, and design concerns in contemporary business activities and design practices. Furthermore, it is intrinsically linked to the ultimate design trajectory, feasibility evaluation, and resultant design projects. Secondly, the current design and development of everyday-use products focuses primarily on three distinct types: retrofit design, product line development, and new design. Once again, in the current new product development of daily-use products, there are different definitions, design processes, and methods. Although different designers have different understandings and practical experiences, the design process of daily-use product development is relatively fixed in the overall view. Meanwhile, the interview data show that designers have the habit of applying design methods, research methods, and modelling methods in an integrated way and generally have a state of design method backwardness. In addition, the use of AI has gradually become a common design tool. Finally, the design process is based on the characteristics of daily-use products, and the overall style of the product is predetermined. The data indicates that natural, functional, and entertaining forms are emphasised. Additionally, light luxury style and cartoon style have emerged as significant fashion trends in the daily-use products market in recent times. Simultaneously, the product-centric focus of the CMF has been relocated to experience preparation and pre-design elements. Positiveness, proximity, and usability are corresponding general characteristics. Furthermore, the design cycle holds significance in the development and design of daily-use products, given that the frequency of product replacements is a defining characteristic of such items(see Table 2).

Table 2. Analysis of coding sub-theme to the main theme

Description	Sub-theme	Theme
Designer	Awareness and Project orientation	Design relationship
Design director		
CEO		
Servicing company/serviced company	Aim of design	
TOP companies and small businesses		
Project risk and feasibility assessment		
New development (complete design)	Standard process	Type of design development
Product line innovation (expanded design)	Part of the process	
Reshaping (simple design)		
3/4/5 phases	Type of design phase	Design process
Design process and content	Relatively fixed design process	
Reliability of research data	Priority of importance	
Design positioning and dispersion	Intermediate phase	
Intervention in design methods		
Design Delivery	Relatively easy stage	

User profiling, association methods, brainstorming, etc.	Design methods	Integration of methods
Stacked, combined, bionic,	Modelling methods	
Geometric methods, modularity, parameterisation, etc.		
Appearance, material, finish (texturisation)	CMF of the product	
Interesting, functional, natural forms	Stylised trends	
Light luxury style, cartoon style, minimalist style		
AI technology-assisted	Modern design tools	
Lifestyle, proximity, and positivity	General characteristics	Product Features
Simplicity, ease of use	Lifestyle	
Closely related to life scenarios		
Fast product updates	Update Frequency	
Time period of design		

Discussion on the integration of YangJiaBu new year woodcut prints into daily product design

Despite the growing recognition of the significance of the product design development process in contemporary creative and cultural sectors and business operations, there remains a requirement for cultural resource-based feasibility framework studies and targeted design process analyses. Simultaneously, the design principles governing the everyday utilisation of intangible cultural heritage ought to be informed by the objectives of regional development and local cultural resources. At the current stage of development, the innovative application of integrating YangJiaBu new year woodcut prints into daily-use product design is the process of constructing a mapping relationship from the sensual imagery of Yangjiabu woodblock prints to cultural modelling features. At the same time, it is also an innovative exploration of a specific stage of social development and regional cultural characteristics. When promoting cultural innovation, it should be discussed in the context of product development processes and methods.

First of all, during the exploratory phase of product design, research is conducted on the cultural attributes of YangJiaBu new year woodcut prints, materials, craftsmanship emotions, and other relevant factors. An analysis of these elements is conducted about the target market, products, and requirements. This phase is predicated on data collection and research, and the integrity of the data will directly influence the design's positioning and trajectory.

Furthermore, during the phase of product design definition, the following steps were taken: establish a framework for cultural daily use design, construct regional cultural characteristics and a hierarchical analysis structure of Yangjiabu woodblock prints, extract, categorise, and summarise design elements, and progressively develop a framework for product positioning that reflects culture. Hierarchical analysis, factor analysis, cluster analysis, kano model, etc. can be borrowed as research methods to assist in the elaboration of culture from the three levels of visual form, cultural function, and cultural emotion, including explicit and implicit characteristics, with the help of methods such as the method of "patternology," the theory of composition, and the grammar of shapes. Meanwhile, the manifestation of cultural sentiments is frequently communicated to the user through design. While user demand is undeniably significant, it is equally imperative to regard output culture as the fundamental content. At this juncture, designers must not only comprehend the connotation of culture but also integrate it with techniques such as design narrative to elucidate design positioning and design language to progress the conceptualization and feasibility evaluation of cultural creativity.

Again, in the product design and development stage, the focus is on promoting the expression and realisation of the design, which includes the dispersion, confirmation, and prototyping of the design, as well as the prototyping and testing of the model. This stage focuses on combining the use of design methods, including the comprehensive use of research methods, design methods, modelling methods, etc., to promote the visual realisation of the design from the product style trends and CMF, for example: using modular design, parametric design, and other methods, combining interesting forms, natural or geometric forms, etc., and adopting a variety of modelling means such as combining and stacking, analogy and symbolism, deconstructing and reshaping, mutation and expansion, etc., and, at the same time, with the help of the details of the changes in the material, texture, decoration, etc. As the critical developmental phase of cultural design, this stage offers an assortment of concepts and techniques for the implementation of traditional culture in design. At this juncture, there remain certain challenges regarding the alignment and fusion of design expressions, which will subsequently require modification to correspond with contemporary aesthetic trends and lifestyles. Hence, during this phase, the design methods may be implemented alongside particular practices that are directed by a general methodology. Furthermore, the design methods may be combined to offer a more comprehensive guide and reference.

Finally, the delivery phase of the design focuses on product implementation, with an emphasis on product delivery and production readiness to track data, audit and collect feedback, optimise strategies, and make adjustments for improvement. Simultaneously, to regulate the amalgamation of conventional culture and design for everyday use, it is imperative to consider not only the harmonious relationship between culture and design but also the subsequent conception of sustainable cultural development. This entails developing a range of design applications and organising systematically the design of supplementary services, including educational activities, digital products, and more. By adopting this approach, it is possible to enhance the overall innovative development and cyclical process of culture and products, optimise the interaction between traditional culture and contemporary lifestyle, and achieve social innovation and cultural sustainability through the incorporation of Yangjiabu woodblock prints into the design of everyday products(see Figure 4) .

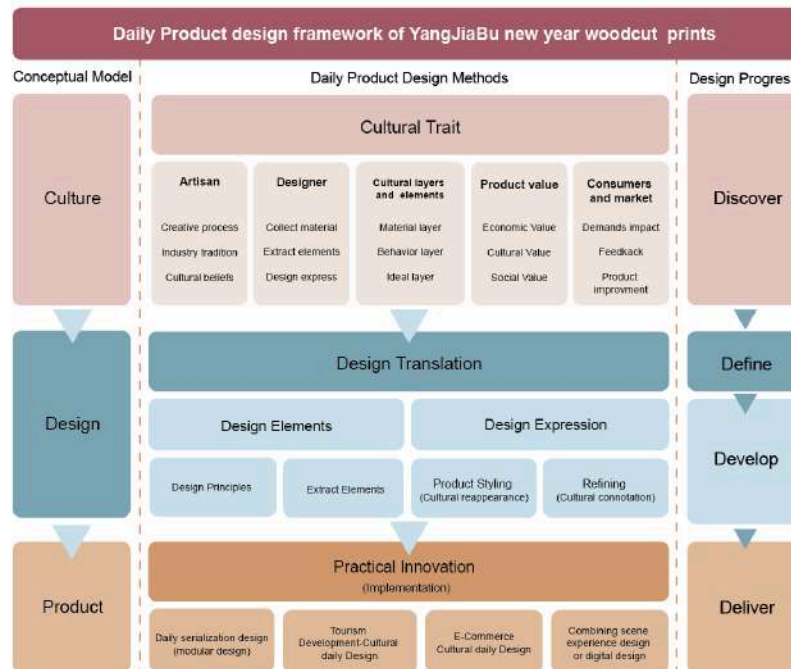


Figure 4: Daily product design framework of YangJiaBu new year woodcut prints.

CONCLUSIONS

In conclusion, Without appropriate and effective measures, the inheritance and cultural development of YangJiaBu new year woodcut prints will confront a complex situation and uncertain future. This study aims to establish a harmonious and benevolent interactive relationship between Chinese folk culture and daily-use product design, to form the sense of order in daily use that is the path and to preserve the aesthetic pleasure of design in life, and to make the design process and performance of folk cultural products more recognizable as cultural products and innovative in national culture. In this context, based on the contemporary lifestyle and the diversified needs of the public, the effective combination of cultural innovation and product design will play an important role. Cultural innovation is a very good method of protection, reflecting the continuous improvement of the people's spiritual and cultural level; the consumption and use of it also reflect the state of demand for innovation and product development in contemporary society, and it is a benign development and inheritance of traditional culture. As China's intangible cultural heritage, YangJiaBu new year woodcut prints convey the aesthetics and connotations of traditional culture to modern society, realizing the creative transformation of cultural values in contemporary daily-use design. The results of the research and thematic analysis of the cultural resources of YangJiaBu new year woodcut prints can help better reflect current regional cultural issues and development relationships; at the same time, it provides visual analysis and insights into design methods and processes for the integration of YangJiaBu new year woodcut prints into daily-use products, which is of significance in promoting the development of the innovation industry of traditional Chinese culture and promoting the structural adjustment and optimization of the cultural industry for social innovation; and it provides a design for the products Provides a source of inspiration, inspires multidisciplinary exploration and applied research on traditional folk culture, and helps to explore and enrich the modern cultural design. As for the recommendations, in order to reflect the advancement and innovation phase of the national cultural strategy, the regional innovation of traditional Chinese culture should be developed proactively in a manner to encourage the local community and stakeholders to respond actively to the innovative development of culture and to the industrial upgrading. For the time being, YangJiaBu new year woodcut prints exhibit two distinct trajectories toward cultural innovation; nevertheless, certain challenges persist in the realm of cultural development. Subsequent investigations may incorporate contemporary cultural issues and resources, employ methodical analysis techniques to extract cultural attributes and design components, and furnish scientific research and data to foster cultural innovation. Furthermore, expert testing and feasibility assessments are needed to supplement and summarise the innovative design framework for traditional culture in order to better meet the sustainable development of traditional cultural industries and innovations.

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Characteristics of Recycled Plaster of Paris At Several Different Temperatures Between 150°C - 190°C During Recycling Process

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ABSTRACT

A significant amount of solid waste is dumped by the ceramics sector, which is a worry for the environment. As well known, Kuala Kangsar, Perak, Malaysia is the location to a large ceramics industry. In Malaysia, there are landfills, but not all of them can manage solid waste perfectly. As a result, many waste disposal contractors look down on solid waste management such as for Plaster of Paris (POP). This is even more complicated when there are a handful of them who take the easy way out by disposing of POP waste by planting or dumping it into rivers and seas. This causes various problems to the environment and health. The aim of this study is to identify how to recycle waste mould into new plaster without affecting their casting performance. This paper shows the study of the effect of characteristics Recycle Plaster of Paris (RPOP) compared to New Plaster of Paris (NPOP). Drying temperatures are performed at (150°C, 160°C, 170°C, 180°C and 190°C) for RPOP and use the same 60% of material and 40% of water ratio and tests for porosity, absorption, setting times and particle size are performed. The results indicate that all samples of Recycled Plaster of Paris performed well and can function similarly to New Plaster of Paris at different temperatures.

Keywords: *Recycle Plaster of Paris (RPOP), New Plaster of Paris (NPOP), Temperature, Drying*

INTRODUCTION

As reported by Muhammad Yusri (2020), the waste disposal in Malaysia increases dramatically every year. This is because of the daily waste production among Malaysians recorded an increase of 100.71% to 38,142 tons in 2008 compared to 19.00 tons in 2005. The cause for solid waste dumping is due to the growth of resources or increase in population, socio-economic and lifestyle of Malaysians, unsystematic solid waste management and indifferent society (Bee, 2016). Dumping of wastes in open fields and rivers is common even until today and a study of waste disposal behaviour in Kuala Lumpur indicated that 31.9% of waste were disposed-off of by open burning, while 6.5% were dumped into the river system as discussed by Murad and Siwar (2007). Hence the environmental safety concern in Malaysia was secondary and most municipalities had a tough time in finding new disposal sites as the existing disposal sites were nearly exhausted. The problem of solid waste in Malaysia is increasingly worrying many parties, especially in the Ministry of Housing and Local Government. A total of 1552,238 tons of solid waste was disposed-off of from January to June 2019. The Government has implemented various efforts to reduce the delivery and disposal of solid wastes to landfills to prevent environmental pollution.

In general, ceramics is a material with desirable properties such as high strength and hardness, high melting temperature, and chemical humidity. Ceramic products require necessary processes such as forming, drying, and firing. The forming process required for the use of Plaster Of Paris (POP) is the main material used in this process called casting Roux, (2016). The clay will leather hard for 1-2 days and become green ware before firing. After firing the product during reaching up to 800°C - 900°C is called bisque firing. At the time of bisque ware, the product will be glazed and fired at a temperature of 1200°C to get the finished product. Some ceramic products such as electrical insulators, dinnerware and tiles may then undergo glazing process.

Keane (1916) reported that Plaster Of Paris is a solid material originally made from white powder Calcium Sulfate Hemihydrate that will harden when it is mixed with water and left to dry until it becomes solid. The material is used in various fields including for construction, medicine, industry and some universities that make this material as a topic subject for learning in lectures, especially in the field of ceramics. The basic material used for Plaster of Paris (POP) is gypsum. The POP in the powder form will be mixed with water into desired form. Once the POP is set, it will be hardened and firmed. It will also become heavy. The chemistry after the POP set affects the physical properties of the POP. Hence, this problem needs to be addressed to understand the reusability of the used POP. However, it is a problem for universities and students to provide this raw material in large quantities and for free because it is expensive as Mould is used in ceramic to support and form clay. It is made from a porous material to draw moisture from the clay. This is commonly plaster, although simple press-moulded forms can be made from low-fired bisque. There are two types of mould. First, press mould, which is used in conjunction with hand-building techniques for making pieces such as functional dishes and bowls, architectural details, large shapes, and sculptures. According to Sharma and Prabu (2013), press mould allows the maker greater control during construction and suit forms that would be difficult to throw or slip cast, second is slip casting, which involves pouring liquid slip into a plaster mould. The water content of the slip is absorbed into the plaster, leaving behind a unified skin of clay. Making a mould for slip casting requires a certain degree of accuracy, which some makers find very appealing. It is excellent for producing crisp forms and multiples of an object, each one being identical to the next.

Plaster of Paris should be consistently stirred with clean utensils that are free from set plaster. The optimum stirring time is dependent on the size of the batch and the dimension of the stirring device. Plaster of Paris will not be evenly mixed if it is not stirred long and if stirred too long the mixture becomes too thick. In both cases this has a negative effect on product characteristics. Longer stirring generally leads to great strength, reduced absorption capacity and shorter setting time. Plaster which is

vacuum-mixed has lower absorption capacity, reduced expansion, and increased strength. Plaster of Paris and water are mixed in proper proportion to create the mould utilised in the ceramic industry.

According to Pinheiro and Camarini, (2015), the gypsum plaster waste in Brazil is 4 percent to 15 percent of waste for building and demolition. Environmental legislation recommends that this waste is meant to be recycled to prevent soil and groundwater pollution. The purpose of this research is to demonstrate that recycled gypsum plaster preserves its functionality when submitted to similar periods of recycling. The recycled gypsum plasters have been produced over three consecutive recycling cycles by grinding and burning the waste. The products which were recycled were assessed according to chemical and physical properties. The findings obtained indicate that both recycled and industrial gypsum plaster is equivalent to that used in the building industry. The aim of this study is to identify that used POP can be recycled and reused as new plaster without affecting its casting performance. This Recycle Plaster of Paris (RPOP) method is environmentally friendly when reused. The resulting recycling process begins by finely grinding the Plaster of Paris waste and drying the fine powder in an oven at a temperature of 180°C for 3/hour as reported by Bardella & Camarini, (2012). However, in this study the researcher has changed the drying period of RPOP. Therefore, some tests have been done on the RPOP sample to find out the reaction.

RPOP needs to preserve the properties of the plaster. When the RPOP is ready to be used for the mould making process, the absorption test is studied to ensure that the RPOP mould can absorb the water content in the slip just like a new mould. In addressing the goals of this study, several research problems need to be identified.

METHODOLOGY

Six types of samples were used in this study: New Plaster of Paris (NPOP) and Recycle Plaster Of Paris (RPOP) with five different temperatures. The samples were tested with NPOP as a comparison guide or controller to perform all the tests to investigate characteristics of RPOP. The RPOP was obtained from waste mould from Perbadanan Kemajuan Kraftangan Malaysia Perak Branch. After the collection, the waste material was crushed and sieved in a suitable machine to filter particles smaller than 1.25 mm. The powder RPOP was then put in the dryer at five different temperatures – 150 °C, 160 °C, 170 °C, 180°C and 190°C– at intervals of 1 hour. This study was proceeded by checking the compressive strength of the concrete bars, porosity test and water absorption. Compressive strength analyses are tested by using the Compressive Strength Testing Machine (ASTM Standard).

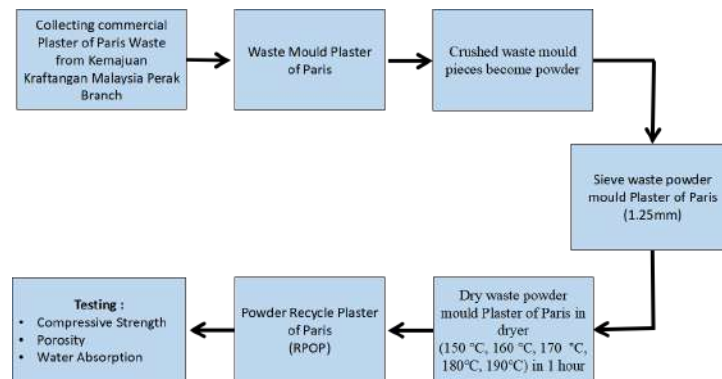


Figure 1: Process of preparing Powder Recycle Plaster of Paris (RPOP) and Testing

RESULTS AND DISCUSSION

Preparation of New Plaster of Paris (NPOP) And Recycle Plaster of Paris (RPOP)

Sample mould Recycle Plaster of Paris that had been prepared by using powder Recycle Plaster of Paris that was dried in dryer at different temperatures (37°C,150°C,160°C,170°C,180°C, and 190°C) and mixed with water will be blended with water for the plaster to harden. However, at 37°C, RPOP does not solidify because the air content in the RPOP powder is not reduced by the drying method. Plaster is poured into the container and sifted with a spoon. For this sample, the ratio was 40g of water to 60g of NPOP or RPOP material. In this study, 7 samples were tested, as shown in Figure 2.



Figure 2: Hard set samples NPOP and RPOP (37°C,150°C,160°C,170°C,180°C,190°C)
(Source: Author's collection)

Compressive Strength

According to the results in Figure 3, the compressive strength at a drying temperature of 150 °C is highest when a ratio of 40:60 is used, obtaining a compressive strength of 4.36 kN. At a temperature of 160°C, the compression strength is 2.58 kN, which is the lowest recorded and the result is nearly identical to NPOP, which is 2.63 kN, with a difference of 0.05 kN. However, at 170°C, compressive strength began increasing 0.48 kN and dropped 0.11 kN inconsistently, then decreased to 180°C and increased again at 190°C. The amount of water present, as well as the temperature at which the RPOP is mixed and dried, have an impact on this. According to Li et al. (2018), gypsum shows varied dehydration characteristics and physical properties, as well as hemihydrate activity, depending on the temperature of production. The compressive strength measurements show that at 160 °C, the values are nearly identical to NPOP. Extraction of water from the medium recycling process at 160 °C improves the water content and density of the RPOP mixture during mixing.

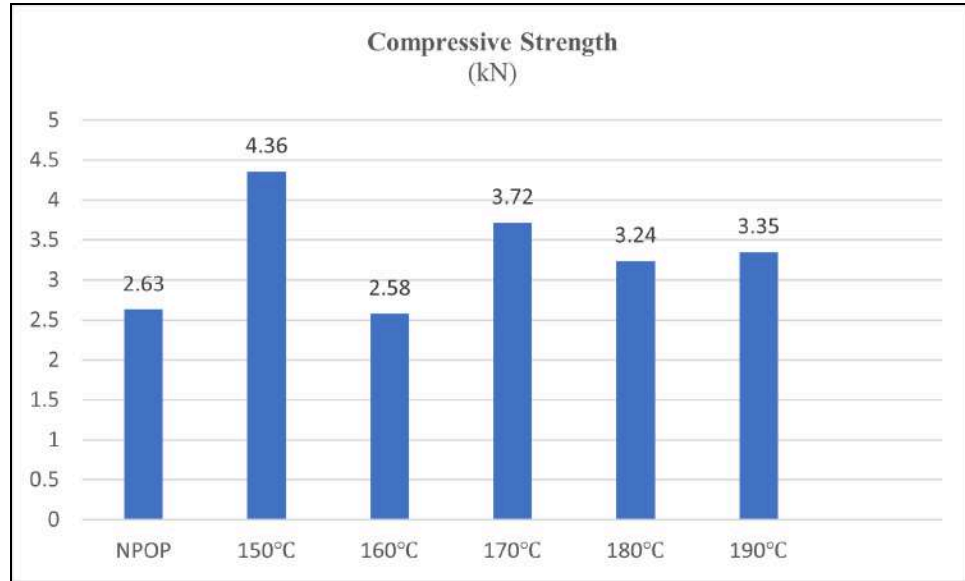


Figure 3. Compressive strength at Different Drying Temperatures

Porosity

Figure 4 shows the percentage of porosity for NPOP and RPOP at various drying temperatures. The graph plot shows that RPOP 180°C has a lower porosity percentage of 144%, whereas RPOP 160°C has a higher percentage of 157%. According to Nawi and Badarulzaman (2015), the percentage of porosity decreases can happen because the number of empty space porosity decreases in each sample analysed, which is determined by the temperature used. When the number of temperature is added, the fraction of voids in the sample will decrease and the bonding between particles will increase which will cause low strength in the sample. According to Nawi and Badarulzaman (2015), data shows that the percentage of porosity decreases from 950 °C to 1050 °C. At temperatures as high as 1050 °C, the number of pores and empty spaces may decrease. Furthermore, because POP is a very porous ceramic material with a large internal surface comprised of interlocking crystal, additive POP wastes increase the percentage of porosity. This analysis shows that the study's control sample, 160°C, is almost equivalent to NPOP.

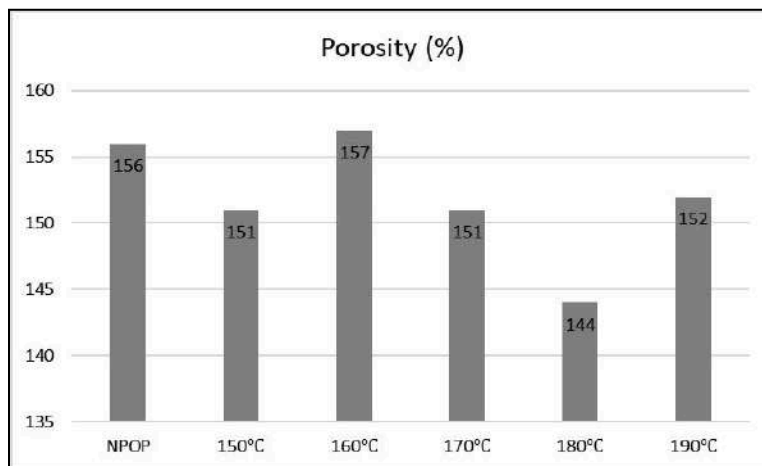


Figure 4: Percentage of porosity at Different Drying Temperature

Water Absorption

The samples of NPOP (150°C, 160°C, 170°C, 180°C and 190°C) were dried for 4 hours at a temperature of 55°C before water absorption was tested. As shown in Figure 6, the percentage of absorption decreases from 150°C to 160°C, an increase of 1.56% however the percentage decreased from 170°C until 190°C. This is because differing drying temperatures might have an effect on it. Therefore, even though the ratio of water to RPOP powder is constant, the percentage of water absorption decreases as the temperature increases. According to Madu (2016), the amount of water used causes the rise in hardness in Plaster of Paris. When the volume of water increases, the fraction of voids increases, while bonds between particles decrease and resulting in a low sample strength.

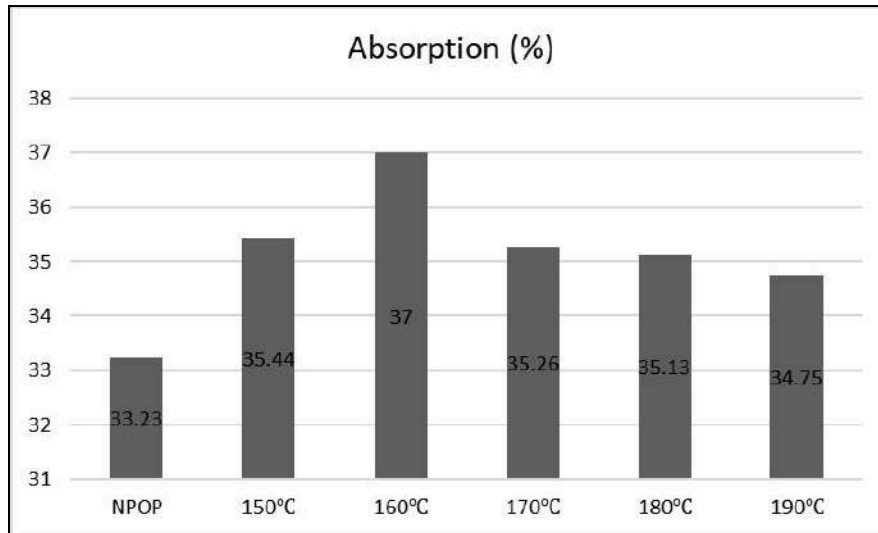


Figure 6. Percentage of water absorption

CONCLUSIONS

The use of various temperatures (150°C, 160°C, 170°C, 180°C, 190°C) for 1 hour produces a finding that all these temperatures can be utilised in the recycling process. The result of this study shows that RPOP is recyclable and may be relied on to produce mould casting as well as through the recycling process. However, this study shows that the RPOP can be recycled at the optimum temperature of 160°C for the same purpose as the original binder. As a result of this research, RPOP is recyclable through the recycling process. For the results of compressive strength and porosity, 160°C is the closest to NPOP. For the results of water absorption at a temperature of 190°C is needed, which is almost the same as NPOP, however, this RPOP can still be used to make moulds or model products. RPOP 160°C has the same physical and chemical properties as NPOP, but the water absorption at 190°C has almost the same result as NPOP. RPOP can still perform the same process as NPOP if it is shaped into a mould.

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Comparison of Plant Application and Design of Chinese and Western Healing Gardens

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ABSTRACT

Using plants in therapeutic gardens has become an essential element in healthcare environments. In the future, as research and practice delve more profoundly, the application of plants in therapeutic gardens will continue to evolve. Scientific foundational research will explore the deeper connections between plants and human health, providing a more significant basis for plant selection and combinations. Cross-cultural collaboration will enrich the diversity of plants, benefiting users from various regions. Involvement will drive the collaborative design of plant landscapes to better meet user needs and create more personalised therapeutic gardens. Objective: As therapeutic gardens are outdoor garden spaces primarily catering to users' psychological health and therapeutic needs, this study compares the application and design of plants in therapeutic gardens in both Western and Eastern countries. We aim to review the literature on this topic, categorise and compare plant design elements in therapeutic gardens from both regions and provide plant design guidelines for medicinal gardens. Methods: A comprehensive review of literature and case studies related to this topic. Conclusion: From a comparative perspective between Western and Eastern approaches, it is concluded that plant design in therapeutic gardens should incorporate both strengths to enhance the therapeutic environment in these gardens. Our design guidelines provide essential components for landscape designers to effectively integrate plant design when creating therapeutic gardens.

Keywords: *Therapeutic Gardens, Plant Utilisation, Cross-Cultural Collaboration, Design Guidelines, Comparative Analysis*

INTRODUCTION

A healing garden, also known as a therapeutic or beneficial garden, is a type of landscape design that emerged in the 1950s and 1960s in the United States and European countries (Bates, 2018). Healing gardens encompass four key aspects: they are oriented towards vulnerable populations, have the purpose of promoting recovery, primarily utilise plants as essential elements, and employ interaction as a medium (Mariana & Wijaya, 2020). Plants represent versatile elements in landscape design, capable of creating diverse garden spaces and composing various landscape effects. This paper primarily focuses on how plants are applied and designed in healing gardens by comparing the practices in Western and Eastern contexts. It begins by discussing the role of plants in healing gardens, then proceeds to describe the application of plants in healing gardens in Western and Eastern contexts, and finally contrasts the similarities and differences in the design elements of healing gardens between these two regions. This comparative analysis identifies issues and strategies suitable for the international design and application of plants in healing gardens.

LITERATURE REVIEW

Role of Plant Landscapes in Healing Gardens

Plants play multiple roles in landscaping in healing gardens, positively impacting mental and physical health.

Psychological Relaxation and Stress Reduction

The plant landscapes in natural environments can promote psychological relaxation and alleviate stress and anxiety. The colours, shapes, and textures of flowers, plants, and trees can evoke positive emotional experiences, aiding individuals in mitigating their feelings of tension.

Facilitating Recovery and Rehabilitation

The selection of plants in healing gardens should consider rehabilitation needs beyond their aesthetic appeal. Plants, through photosynthesis, absorb carbon dioxide from the air and produce oxygen. They can also absorb harmful gases from industrial pollution and vehicle emissions, maintaining fresh air for a comfortable atmosphere. Furthermore, photosynthesis in plants generates a photoelectric effect, producing negative air ions, which have therapeutic effects (McIntosh et al., 2022). Some plants release significant amounts of volatile substances during their growth, including aromatic flammable substances like eugenol. Phenolic substances can enhance the human immune system, and the resin produced by pine trees has effective air disinfection properties (Sekhon et al., 2017).

Providing Ecological Experiences

Interacting with natural plants in healing gardens enables users to experience the balance of ecosystems, fostering a deeper connection with nature. This ecological experience assists people in better engaging with their surroundings, promoting emotional and physical recovery. It creates a healing atmosphere that aids patients in alleviating the tension associated with clinical environments.

Plant Applications in Healing Gardens

It introduces the use of plants in healing gardens internationally and in China. It concludes with a comparison based on a classification of the different theoretical bases for using plants in healing gardens in China and the West.

International Research Overview

In recent years, the research on the psychological impact of the built environment on human health has highlighted the growing importance of medicinal plant design and its positive effects on users, as discussed by Silva et al. in 2018. This overview underscores the need for the tailored design of hospital rehabilitation gardens to address the specific requirements of different patient types. The study provides standard evidence-based design (EBD) recommendations for hospital rehabilitation gardens, including considerations for the diverse selection of plant species, such as the cautious choice of plants when catering to patients undergoing treatment, for instance, cancer patients who benefit from avoiding strongly scented plants.

Research findings, such as those in the study titled "The Importance of Healing Gardens in terms of Palliative Care Center", emphasise the importance of customising the design of hospital rehabilitation gardens based on the needs of various patient categories. It suggests that various plant species with different features can be employed in these gardens (Silva et al., 2018).

Additionally, data on healing garden elements will determine the types of plants to be used, as indicated in the work of Yosica Mariana and Yulianto Wijaya in 2020. These plants, with diverse characteristics, will be placed strategically in specific areas within the healing garden to support rehabilitation activities.

Furthermore, the investigation into the significance of plants and gardens in healthcare design, as conducted by Nurizzati M. Yusri and Khairul Asyraf Mohd Rodzi in 2020 (McIntosh et al., 2022), provides valuable insights. Their analysis highlights the characteristics of garden plants as reference points for enhancing spatial environmental quality considerations, especially in design and planning. The study proposes the incorporation of green vegetative landscapes within existing spaces, intensifying and supporting the therapeutic effects of the proposed areas.

One facility that exemplifies this approach is the Philippe Pinel Psychiatric Hospital in Pezinok, serving as a pilot case study for healing and therapeutic design (Hansen et al., 2017). Surveys were conducted among staff and patients, ultimately affirming the pivotal role of green vegetation as an essential tool in creating medical facilities.

Internationally, the application of plants in healing gardens primarily centres on enhancing users' psychological well-being and fostering positive impacts through the selection and characteristics of plant species. This approach aims to elevate the quality of the spatial environment (Gann et al., 2019).

Chinese Research Overview

In the 1990s, research on therapeutic landscape architecture in China made significant progress, drawing on international experiences. A concept emerged in which the integration of plants, traditional Chinese medicine, and native culture was proposed, explicitly defining the concept of rehabilitative

healthcare garden design. This brought forth fresh ideas and approaches for developing therapeutic landscape architecture.

Scientific research indicated that plants such as spruces, pines, peonies, and other species produce chemical substances with significant therapeutic effects (Belčáková et al., 2018). These substances can alter the negative air ionisation of the surrounding natural environment and reduce the concentration of negative electrons in the human body. Furthermore, the sensory stimulation provided by plants can promote the generation of brainwave activity, revitalising individuals in a short period.

Research demonstrated that plants can significantly affect the humidity of the surrounding environment, aiding in the recovery of children with pulmonary diseases and alleviating the emotional states of individuals with depression (Semenya & Maroyi, 2013). As a result, scholars conducted in-depth studies on various population groups, seeking to make further discoveries.

In the late 20th century, Shanghai began to explore therapeutic garden tourism landscapes and achieved substantial success in major cities such as Hong Kong, Beijing, and Shenyang (Yi et al., 2020). These endeavours have promoted both the theoretical and practical development of this field. For example, the Lujiazui Green Space Park in Shanghai incorporates the traditional Chinese Five Elements theory and organ theory, creating a unique natural landscape by combining different plants. The Mingzhou Hospital in Ningbo utilises trees from both northern and southern regions, such as red pines, deciduous trees, and mangroves, applying the principles of Tai Chi and using light- and shade-loving vegetation to create a landscape where nature and humanity coexist, allowing visitors to experience the allure of nature in tranquillity. Additionally, cities like Kunming have established specialised medicinal plant gardens.

These developments signify a dynamic shift in the study and application of therapeutic gardens in China, incorporating traditional concepts and modern research to create environments that promote health and well-being.

Classification of plants in healing gardens

At this stage, there are many kinds of classification for plants in the healing garden; for example, according to the human senses, the efficacy of plants, the decorative effect of plants, and the configuration of plants in China also join the theory of the five elements of Chinese medicine.

According to the different psychological and physiological feelings generated by the five senses of human health plants, they are divided into five types: visual, auditory, olfactory, tactile, and gustatory. Different healthcare plants permeate each other in the rehabilitation garden to form a diversified rehabilitation landscape. The following list represents the different types of sensory plants and their functions.

Table 1. Representation Of Different Types of Sensory Plants and Their Roles

No	Category	Representative Plants (e.g.)	Functions
1	Visual Plants	Flowers (e.g., roses, tulips, peonies)	Provide visual delight with beautiful blooms.
		Plants with colourful leaves (e.g., Japanese maple, golden pine)	Add a diversity of colourful elements to the landscape.

2	Auditory Plants	Wind chimes (e.g., wind chimes, bamboo)	Create gentle sounds, such as those of wind chimes in a breeze.
		Plants with rustling leaves (e.g., herbaceous plants, bamboo)	Produce soft sounds when swaying in the wind.
3	Olfactory Plants	Mint, rosemary, culinary herbs	Release fragrances, offering olfactory stimulation.
		Fragrant flowering plants (e.g., jasmine, roses, lavender)	Emit pleasant scents from their flowers.
4	Tactile Plants	Lamb's Ears (Stachys)	Feature soft leaves suitable for touching.
		Succulent plants (e.g., cacti, succulents)	Offer a variety of textures that induce tactile experiences.
5	Gustatory Plants	Fruit trees (e.g., apples, cherries, citrus)	Provide edible fruits, satisfying gustatory needs.
		Vegetable plants (e.g., tomatoes, carrots, peppers)	Offer fresh flavours to users.

Different plants can be selected based on the design objectives of healing gardens and users' needs to create a rich sensory experience, aiding users' health recovery, relaxation, and overall well-being. Plants can also be classified according to functional factors, such as medicinal vs. non-medicated.

Medicinal Plants encompass those with medicinal value and therapeutic efficacy, while Non-Medicinal Plants serve primarily ornamental and aesthetic purposes. Medicinal Plants are selected for their specific medicinal functions, which can be utilised for treating certain physical discomforts or promoting health. Regional Adaptation is another classification criterion, categorising plants based on their adaptability to local climate and soil conditions. This ensures that the plants within the garden can thrive and flourish in their environment.

In Chinese healing gardens, plant arrangements are often integrated with Traditional Chinese Medicine's Five Elements theory to create a harmonious environment that fosters individuals' physical and mental well-being (Zhu et al., 2021). Here are examples of how plant arrangements can be harmonised with the Five Elements theory:

Table 2: Examples of Plant Configurations Integrated with the Five Elements Theory

No	Five Elements Attributes	Color and Plant Examples	Representative Significance
1	Wood	Tall, lush green plants such as trees and shrubs.	Symbolises growth and vitality.

2	Fire	Plants with bright red, orange, or purple flowers like roses, geraniums, or violets.	Evokes passion and vitality.
3	Earth	Plants with yellow and brown colours like sunflowers or oncidium orchids.	Creates stability and balance.
4	Metal	White or golden-yellow flowers like lilies or tulips.	Offers a sense of freshness and purity.
5	Water	Plants with blue and black colours like blue irises or black bamboo.	Creates a fluid and calm atmosphere.

RESEARCH METHODOLOGY

Literature Review

The literature review involves collecting, synthesising, and analysing relevant existing research literature to extract meaningful information regarding the design and effects of plant landscapes in healing gardens, particularly within both Eastern and Western contexts. This approach aids in accessing research findings from a global perspective, exploring the use of plant landscapes from various angles, and understanding their impact on users of healing gardens. Information is gathered through database searches, literature cataloguing, and specialised journals concerning cases, experimental results, design concepts, and more related to using plant landscapes in healing gardens. Subsequently, this literature is organised, analysed, and compared to extract common design principles, effective plant species, and user feedback, supporting decision-making in healing garden design.

Case Studies

Case studies are an effective research method for in-depth exploration of the application of plant landscapes in healing gardens. The following is a detailed description of the case study methodology.

Case Selection: When studying plant landscapes in healing gardens, one or more representative healing gardens can be selected as research cases. These cases can represent different countries and types of healing gardens to ensure the broad applicability of research results.

Data Collection: For each case, comprehensive data collection can be conducted. This includes on-site observations and recording the design elements of plant types, layout, colours, shapes, and more in the healing garden. Additionally, interviews with garden designers, hospital administrators, and users of the healing garden can provide insights into the design rationale, real-world application effects, and user feedback.

Data Analysis: The collected data can be subjected to in-depth analysis. The strengths and weaknesses of plant landscape designs in healing gardens can be summarised by comparing the design

characteristics and effects between different cases. Furthermore, observational data can be combined with user feedback data to analyse the impact of plant landscapes on the physical and mental health of users in healing gardens.

Discovering Design Principles: Through case studies, researchers can find design principles for plant landscapes in healing gardens. For example, which plant species can effectively alleviate user stress and anxiety, or what layouts create a comfortable environment for rest and interaction? These design principles can serve as guiding recommendations for the planning and designing future healing gardens.

Case Comparisons: Through comparisons of multiple cases, researchers can understand the differences in healing garden design across different countries and cultural backgrounds. This helps extract universal design principles while uncovering unique design features in specific cultural environments.

Limitations and Future Prospects: Case studies have limitations as each case may be influenced by specific environmental and contextual factors. However, conducting comprehensive research across multiple cases enhances the reliability and effectiveness of the study. Future research can further explore the effects of different plant landscapes in healing gardens and how to tailor designs more precisely to user needs.

In summary, case studies are an effective method for gaining an in-depth understanding of the application of plant landscapes in healing gardens. They allow researchers to derive design principles and lessons from real-world cases, providing valuable insights for the planning and designing healing gardens.

FINDINGS

By analysing the use of plants in Chinese and Western healing gardens and examining the use methods. Key design elements of healing garden landscapes can be summarised. By examining the commonalities and differences in the application and design of plants in healing gardens, it is possible to gain a more comprehensive understanding of the theoretical and practical aspects of the application and design of plants in healing gardens.

Commonalities

Interactivity: Healing gardens in both Eastern and Western contexts emphasise the role of plants in providing interactive experiences, such as touch and fragrance. Introducing such plants in healing gardens can enhance users' sense of engagement and enrich sensory experiences.

Sustainability: Plant selection and design considerations encompass the growth cycles, maintenance requirements, and resistance to drought and cold, among other factors, to ensure the sustainability and enduring aesthetics of healing gardens.

Colour and Texture: The colours and textures of different plants can evoke varying emotions and experiences (Pichersky & Raguso, 2016). In healing gardens, one can opt for gentle colours and rich textures to create a calm and comfortable environment that aids users in relaxation.

Plant Layout: The arrangement of plants should consider creating different areas based on plant attributes. These may include relaxation zones, walking areas, viewpoints, and more, with plants strategically positioned to support various activities and experiences.

Divergent Aspects

The following points highlight the contrasting elements in the planning and design of plant landscapes in healing gardens in Western and Chinese contexts:

Plant Selection

Western Approach: In designing healing gardens, selecting plants suitable for the local climate and environment is paramount. The plant varieties should encompass herbs, flowers, trees, and more, contributing to visual aesthetics while releasing oxygen and fragrance, all with potential benefits to human health.

Chinese Approach: Healing gardens in China emphasise the selection of plants based on the traditional Chinese Five Elements theory. This approach considers the plants' visual appeal and medicinal value, viewing plants as valuable medical resources.

Sensory Stimulation

Western Approach: Healing gardens in the Western context focus on stimulating the users' senses, including visual, auditory, and olfactory sensations. Plants like wind chimes and lavender create soft sounds and pleasant aromas in the garden, enhancing the sensory experience.

Chinese Approach: Besides visual, auditory, and olfactory elements, Chinese healing gardens also emphasise plants that engage the senses of taste and touch, providing a more comprehensive range of sensory stimuli.

Cultural Philosophy

Western Approach: Healing garden designs typically emphasise psychological well-being and happiness. They aim to create a comfortable environment that can alleviate stress and anxiety, reflecting values in Western culture.

Chinese Approach: Chinese healing gardens incorporate traditional Chinese philosophical concepts, emphasising balance and harmony, often reflecting values and philosophies rooted in Chinese culture.

Function and Rehabilitation Objectives

Western Approach: These gardens aim to provide emotional well-being, reduce stress, and enhance users' psychological and emotional health. They are often used for leisure and relaxation rather than traditional medical treatment (Martínez et al., 2020).

Chinese Approach: Healing gardens in China are designed to promote physical and mental balance and recovery. The selection and arrangement of plants are typically based on traditional Chinese medical principles to aid users in addressing physical and mental health issues.

In summary, incorporating plant landscapes in the planning and designing healing gardens should harmonise with the overarching landscape philosophy. Through plant selection, layout, and interactivity, a tranquil environment conducive to physical and mental well-being can be created (Hesselink et al., 2020).

CONCLUSION

Several essential design principles have been summarised by comparing plant landscape application and design elements in healing gardens in both Western and Chinese contexts to ensure that gardens can provide maximum therapeutic effects and pleasant experiences. The design application of plant landscapes in healing gardens in both Western and Chinese contexts places human needs at the forefront, catering to the psychological and physiological requirements of the users. The shared goal is to enhance the quality of the space and better serve the users. Given that the concept and practice of healing gardens have been developed for a considerable period, applications are well-established, offering various specialised healing gardens to accommodate different types of patients. In China, healing gardens are predominantly situated within the outdoor spaces of large hospitals, major parks, and a few smaller parks, catering to a wide range of users. This necessitates an environment and facilities within healing gardens that align with the needs of the public, resulting in broad design principles with limited specificity (Gann et al., 2019). In the future, there is a trend toward creating specialised functional zones within smaller healing garden environments and integrating advanced Western healing garden plant application and design theories with local culture. Such efforts will significantly enhance the spatial quality established by healing garden plant design.

The application of plants in healing gardens will continue to deepen and innovate. With advancements in scientific research, we will gain a deeper understanding of plants' physiological and psychological impact on the human body, allowing for more precise selection and design of plants in healing gardens. Innovative technologies will give plant landscapes additional dimensions, offering richer experiences. Regarding plant selection, cross-cultural and interdisciplinary collaboration will become a trend. Plant and herbal knowledge from different regions and cultural traditions can be integrated into healing garden design to meet diverse user needs. Sustainability will also receive more attention, with the selection of native plants and a focus on ecological balance becoming critical design factors. Social participation will become a significant aspect of plant application, allowing users to engage in plant selection, maintenance, and use, thus actively participating in the healing process.

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Exploring the Purpose and Types of Home Glass Accessories: Sustainability, Transparency, Aesthetics, and Durability

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ABSTRACT

Glass is omnipresent in applications from packaging to prosthetics, and building to telecommunications, resulting in significant glass waste. This study examines the purpose and various types of home glass accessories and aims to minimize waste through recycling and the development of sustainable products that meet market demands. The research employed interviews with glass designers and a systematic literature review as the primary exploration techniques. The findings provide valuable insights into the sustainability, transparency, aesthetics, and durability of home glass accessories. The literature review revealed that glass is extensively used due to its transparency, chemical inertness, environmental friendliness, availability, and affordability. Glass recycling offers benefits such as conserving natural resources, reducing waste, saving energy, and decreasing air and water pollution. However, certain glass products have a limited lifespan, contributing to waste generation. The interviews revealed that people choose glass products for their transparency, chemical stability, decorative appeal, ease of cleaning, and sustainability. Kitchenware, bottles, containers, lighting units, vases, antiques, and serving ware were identified as common types of home glass accessories. Lighting lamps and vases were found to be the most popular functions.

Keywords: *Glass, Home accessories, Recycling, Sustainability, Wastes.*

INTRODUCTION

Materials play a crucial role in the work of industrial designers, serving as the foundation for object design. Industrial designers create objects with the support of various materials, both existing and newly created to meet specific requirements (Manzini, 1989). The influence of materials extends beyond their structural contributions to permeate the design process and impact aesthetics, functionality, and emotional resonance within the designed object (Lu & Poon, 2019). Understanding the importance of materials is essential for industrial designers seeking to create visually appealing, functional, and emotionally engaging designs (Altin Karataş & Gökkaya, 2018). Designers sometimes work with materials that already exist, and other times they manufacture new materials to meet a specific requirement or product (Cramer et al., 2022).

In the early stages of human development, the search for materials was closely connected to the surrounding environment (Selvakumar, 2021). The emergence of glass as a material during this period serves as a testament to human ingenuity and the profound ability to manipulate materials for diverse purposes. Then, the use of glass in various forms has long been ingrained in human history and serves both functional and aesthetic purposes. Materials transcend their role as mere components; rather, they emerge as dynamic agents that exert a complex influence on the very essence of object design. Beyond their structural contributions, materials permeate the design process, influencing the aesthetics, functionality, and even emotional resonance embedded within the designed object (Lu & Poon, 2019). So, it's important for industrial designers to thoroughly investigate how materials are crucial. This is especially key for those designers who want to create designs that not only look good but also work well and connect with people emotionally (Altin Karataş & Gökkaya, 2018).

Glass is used in a wide range of products, primarily because it is affordable and has several attractive characteristics. Glass properties are unique to the chemical composition of the glass, and they can be changed and regulated by changing composition and/or manufacturing processes. The main concern of this research is that glass is a sustainable material that can be recycled and used several times in designing new products made by recycling. Glass recycling helps in saving energy as cullet melts at a lower temperature than raw materials. Consequently, less energy is required for the melting process. In today's world, the widespread fear of environmental issues hangs heavily over our shared awareness. Chief among these apprehensions is the ominous threat of climate change, an ever-present phenomenon that exacts a toll on our precious natural resources (Sanjay et al., 2015). The intricate interplay between climate change and the delicate balance of ecosystems accentuates the urgent need for proactive measures to mitigate its far-reaching effects (Lu & Poon, 2019).

In the broad and urgent context of environmental concerns, recycling takes on a crucial role in the collective effort to address climate change. Within the broader recycling framework, the specific domain of glass recycling emerges as a focal point, presenting itself as a potential solution to the overarching challenge of recycling efficacy (Guo et al., 2020). Delving into the intricacies and potentialities of glass recycling provides a nuanced perspective on its role as a viable and impactful solution within the larger context of environmental sustainability (Guo et al., 2020). As we navigate the intricate landscape of environmental conservation, understanding the unique contributions of glass recycling becomes crucial for shaping sustainable practices and fostering a resilient approach to resource management (Varberg et al., 2016). Glass accessories hold an intriguing allure for homeowners and decorators alike. They not only serve specific functions but also contribute to the overall aesthetic appeal of living spaces. Understanding the motives and intentions of individuals who opt for these accessories shed light on the underlying factors that drive their demand and popularity (Barr & Deusner, 2021). This study investigates the purpose and types of home glass accessories, with a focus on minimizing waste through recycling and developing sustainable products. Using interviews with glass designers and a systematic literature review, the research sheds light on sustainability, transparency, aesthetics, and durability of these accessories. The

findings contribute valuable insights into consumer preferences, sustainability considerations, and the overall market for glass accessories, benefiting both designers and consumers.

LITERATURE REVIEW

The purpose of acquiring home glass accessories

Glass was possibly one of the first products to be mass-produced in large quantities, and it can be used in a wide range of applications, from packaging to prosthetics, and from building to telecommunications. According to (Lefteri, 2001), Glass is utilized in practically every aspect of human existence, including architecture, food and drink, labs, equipment, instruments, the chemical, nuclear, and electrical industries, lighting, optics, and many more applications. Many qualities make glass attractive, such as it is transparent, chemically inert, environmentally friendly, sustainable, strong, easily available and relatively cheap (Achintha, 2016).

Home glass accessories serve multiple purposes including aesthetic enhancement, sustainability, and practicality. In interior design, glass accessories such as vases, decorative lamps, and mirrors can transform a space, adding style and warmth, and contributing to the overall design (Miller, 2021). Additionally, glass is a versatile material that can be used for various home applications, offering unobstructed views and imparting sophistication. Furthermore, glass bottles and storage jars not only serve practical purposes but also add an aesthetic look to the house interior, reflecting the care and attention of the homeowners (Rajak et al., 2021). When it comes to creating a study room, glass panels or magnetic glass boards can be used for partition purposes, providing a unique and accommodating space for study (Ramstedt, 2020).

The study of home glass accessories also aligns with the principles of sustainability and waste minimization. For instance, the use of frosted glass, textured glass, and stained glass not only serves decorative purposes but also contributes to privacy, allows light to pass through, and is suitable for various applications such as shower cubicles and bathroom windows (Ugwu et al., 2021). Moreover, the importance of using glass bottles at home lies in their reusability and multipurpose nature, allowing for the storage of various food items and serving as decorative pieces (Miller, 2021).

Sustainability and Recyclability

Glass is a highly recyclable and environmentally friendly material, making it attractive to consumers who prioritize sustainability. The ability to recycle glass and reduce waste is a key feature for environmentally conscious individuals. According to the Environmental Protection Agency (EPA), glass recycling enables total renewal and reuse in the raw materials recovery process, leading to energy savings and carbon reduction (Environmental Protection Administration, 2018). For instance, recycling glass can save 1.2 tons of silicon raw materials, prevent 175 kg of waste from being disposed of in landfills, lower the melting point of the furnace by 30%, and reduce air and water pollution (Del Rio et al., 2022). However, it is important to consider the different lifetimes of glass products. While glass is utilized for a variety of functions, products like bottles and food containers often have a brief lifespan before being discarded. Despite this, the European glass industry has established efficient recycling methods, such as bottle cleaning and refilling, as well as the use of broken glass in the creation of new glass containers (Metwally, 2019).

In addition to its recyclability, glass plays a significant role in eco-friendly home decor. It allows natural light into buildings, reducing the need for artificial lighting and contributing to energy savings. Such as Hand Blown glass which offers a wonderful opportunity to recycle glass from discarded bottles and give them a unique new life (Metwally, 2019). Furthermore, glass storage jars, drinking glasses, and decorative glassware not only serve functional purposes but also add an aesthetic look to homes (Del Rio et al. 2022). Several initiatives and businesses are focused on glass recycling and creative reuse. Remark Glass is a zero-waste certified, woman-owned business that is dedicated to innovative and creative glass reuse, offering a wide range of recycled glass products for home use. By incorporating recycled glass products into home decor, individuals can contribute to waste reduction and support sustainable practices (Christensen, 2011).

Aesthetics and Visual Appeal

Glass products are renowned for their sleek and visually appealing appearance, introducing an element of elegance to their surroundings. This aesthetic quality makes glass accessories highly desirable, especially for decorative objects, vases, and lighting fixtures. Accessories serve an authentic function in enhancing the overall aesthetic properties, contributing to the architectural elements' shape. This emphasis on aesthetics is acknowledged by Hosny (2019), who highlights that, for certain accessories, enhancing visual appeal may be their primary function. As Ritchie (2004) notes, glass stands out as a captivating and versatile material that not only showcases the creativity of mankind but also underscores its adaptability. The widespread use of glass in various forms is a testament to its aesthetic appeal, allowing it to be shaped into diverse and visually striking forms.

Durability and Longevity

Glass is widely recognized for its durability, capable of withstanding both physical and chemical stresses. Customers often choose glass products for their longevity and resistance to scratches, corrosion, and fading. Macfarlane (2002) emphasizes that glass's durability makes it an ideal material for physical and chemical experiments, offering ease of cleaning, sealing, and shaping to meet experiment requirements. Its robust nature allows the manufacturing of thin apparatus, enduring atmospheric pressure variations, and exhibiting high heat resistance, making it suitable as an insulator.

In addition, glass maintains a non-reactive nature, as highlighted by Shakhgildyan (2020), meaning it doesn't interact with or alter the taste, smell, or composition of the substances it contains. This non-reactivity is particularly advantageous for glass containers used in storing food, beverages, and pharmaceutical products. The property ensures the integrity and purity of the stored items, making glass a preferred choice for applications where maintaining the original properties of the contents is crucial.

Regarding the term "Periodic Table," this refers to the tabular arrangement of chemical elements based on their atomic number, electron configuration, and recurring chemical properties. In the context of Shakhgildyan's statement, the ability of glass to encompass a wide range of elements from the Periodic Table within its structure highlights the material's unique capability to incorporate diverse chemical components. This characteristic showcases the impact of the Periodic Law, which governs the arrangement of elements based on their atomic structure, on the properties exhibited by glass (Shelby, 2020).

METHODOLOGY

This study's primary exploration technique is a literature survey. In addition to the narrative literature review, interviews were conducted with experts and professionals knowledgeable about home glass accessories. The data collected through the literature review and interviews were carefully analyzed to identify common themes, patterns, and relationships. The findings from these data sources were synthesized to address the objectives of the study and provide a comprehensive understanding of the purpose and types of home glass accessories.

These methods were chosen to provide a comprehensive understanding of the purpose and types of home glass accessories by synthesizing information from both existing literature and expert insights. The collected data were rigorously analyzed to identify common themes, patterns, and relationships, contributing to the study's overall objectives.

Literature Review

It involved an extensive examination of relevant academic papers and books. This approach enabled the identification and synthesis of existing knowledge and perspectives on the subject matter. The literature review served as a foundation for understanding the multifaceted aspects of home glass accessories, including their sustainability, transparency, aesthetics, and durability.

Interviews

The primary exploration technique involved interviews with experts and professionals well-versed in home glass accessories. The selection of interviewees was based on their expertise in the field, ensuring a diverse range of perspectives.

Interviewees

The selection of interviewees was based on their expertise, ensuring a diverse range of perspectives. The interviewees included a glass designer, and a customer interested in home accessories.

Interviews questions

- What is the characteristic that people would like to purchase glass products for?
- What are the types of home glass accessories?
- What is the most famous function for home glass accessories?

FINDINGS

Literature review Results

According to our literature review, the classification of the most common glass accessories in homes according to the type of glass used, divided into three categories: Lighting Units, Kitchenware, and

Decorative Items. Figure 1 presents the findings of this section.

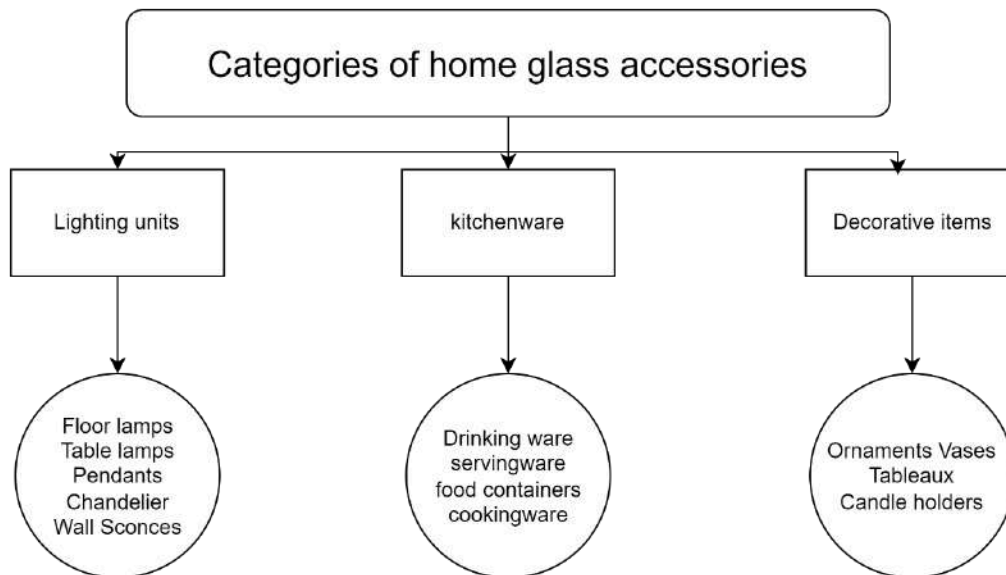


Figure 1. Classification of the most common glass accessories in homes regarding the function.

The image illustrates a chart representing three categories of home accessories based on their primary functions. The first category is Lighting Units, which includes various types of lighting fixtures such as floor lamps, table lamps, pendants, chandeliers, and wall sconces. These lighting units serve both functional and aesthetic purposes, enhancing the illumination and ambiance of living spaces. The second category is Kitchenware, encompassing a range of items used in the kitchen. This category includes drinking ware, serving ware, food containers, and cooking ware. These kitchen accessories are essential for food and beverage preparation, storage, and serving purposes. They play a crucial role in enhancing the functionality and convenience of the kitchen environment. The third category is Decorative Items, consisting of ornamental objects that add visual interest and aesthetic appeal to the home. Examples in this category include ornaments, vases, tableaux, and candle holders. These decorative items serve as artistic elements, contributing to the overall décor and creating a pleasant and inviting atmosphere in various areas of the house. The chart provides a visual representation of these three categories and their associated examples, highlighting the diverse range of home accessories available to homeowners.

Interview Results

According to Interview Results, the interviews indicated that consumers favor glass products due to their transparency, chemical stability, decorative appeal, ease of cleaning, and sustainability.

Table 1. Characteristics Influencing Consumer Choice of Glass Products according to Interviewer Answers.

What is the characteristic that people would like to purchase glass products for?	The glass transparency and bright colors makes people buy it as it adds an aesthetic touch to their home decorations, also glass is easy to reshape using temperature so there's many varieties in glass products, ex: table ware, lighting and home decoration.	It's easy to clean and doesn't react with materials and maintains its luster, tableware and decorative accessories are the most used glass products.	We make Plates made of bottles for serving food. There is a difference between recycled and reused or we call "up cycle", cups cutted by heat or without heat.
What are the types of home glass accessories?	Tableware, lighting and home decoration.	Tableware, accessories like earrings and necklaces, wall hangings.	Cups, plates, unique pieces like antiques, jewelry, lighting units, vases, home accessories, wall pendants and a lot of products with deferent shapes
What is the most famous function for home glass accessories?	Tableware and decorative accessories	Products for food serving.	Decorative and tableware

Table 1 provides insights into consumer preferences and the common types of home glass accessories based on interviews conducted in the study. The findings reveal that consumers are drawn to glass products due to several key attributes. These include transparency, which allows consumers to see the contents of the product. Chemical stability, which ensures the safety of storing food and beverages. Decorative appeal, which enhances the aesthetic of the home. Ease of cleaning, which adds convenience to maintenance. And sustainability, which aligns with eco-conscious consumer values.

DISCUSSION

The study aimed to explore the purpose and types of home glass accessories, with a focus on minimizing waste through recycling and developing sustainable products. The primary exploration techniques included a literature survey and interviews with experts in the field. The findings from these sources were synthesized to address the study's objectives comprehensively.

The literature review provided insights into the versatility of glass as a widely used material due to its transparency, chemical inertness, environmental friendliness, availability, and affordability (Lefteri, 2001; Achintha, 2016). Glass's sustainability and recyclability were highlighted, attracting environmentally conscious consumers with benefits like natural resource conservation, reduced garbage, energy savings, and pollution reduction (Environmental Protection Administration, 2018). However, certain glass products, such as bottles and food containers, were identified to contribute to waste generation due to their limited lifespan (Christensen, 2011).

Glass is a versatile material that can be used in various aspects of daily life, including home décor and smoking accessories. According to Hosny (2019), there are two types of glass accessories: functional and non-aesthetic. Functional accessories are those that are directly connected to the specific functions of the space in which they are used, while non-aesthetic accessories encompass a wide range of types and materials, including wood furniture ornaments, hearth structures, and various other accessories that possess both practical and aesthetic value. In terms of home décor, glass can be used for partitions, structural glazing, doors, and more.

Westbroek et al. (2021) conducted a global material flow analysis of glass, emphasizing the journey from raw materials to end-of-life. Their study sheds light on the global patterns of glass consumption and disposal, providing context to the lifecycle of glass products. In comparison, our study concentrates on the specific realm of home glass accessories, examining the intricacies of consumer choices and sustainability in this niche.

Harrison et al. (2020) explores the recycling of waste glass as an aggregate in cement-based materials, addressing the environmental impact and potential benefits of incorporating glass waste into construction materials. This study intersects with ours in the broader context of glass recycling and sustainability but diverges in its focus on construction materials. Our study zooms in on the consumer-centric domain of home glass accessories.

Da Silva et al. (2021) delves into the recycling of glass waste into foam glass boards, evaluating the life cycle impacts of different foaming agents. Their emphasis on environmentally friendly practices aligns with our study's focus on sustainability. However, their investigation spans a different application of glass waste, emphasizing the potential for foam glass boards in construction.

Transparency and visibility emerged as crucial attributes for glass accessories, particularly in containers used for packaging beverages and food (Harder, 2018; Simon, 2019). The exceptional transparency of glass to visible light makes it a preferred material for architectural applications (Haldimann, 2008). Aesthetics and visual appeal were significant factors in the use of glass accessories, enhancing the overall aesthetic properties of architectural elements (Hosny, 2019). The durability and longevity of glass, along with its resistance to physical and chemical stresses, ease of cleaning, and non-reactivity, make it suitable for various applications, including food, beverage, and pharmaceutical containers (Macfarlane, 2002; Shakhgildyan, 2020).

The interviews revealed that consumers often choose glass products for their transparency, chemical stability, decorative appeal, ease of cleaning, and sustainability. Kitchenware, bottles, containers, lighting units, vases, antiques, and serving ware were identified as the most common types of home glass accessories. Notably, lighting units and vases emerged as the most popular categories among consumers. While the study touched upon various characteristics attracting consumers to glass products, it didn't explicitly address consumer preferences. Further research could delve deeper into understanding the hierarchy of preferences among the identified characteristics to provide a nuanced understanding of what drives consumer choices in the realm of home glass accessories.

Rajamakrishna and Kaewkhao (2019) provide a broader perspective on glass materials and their advanced applications, summarizing the progress in glass science. While our study emphasizes a specific category of glass products, their overview complements our focus by highlighting the versatility and applications of glass in various technological fields.

Sinshaw and Palani (2022) contribute to the discussion by analyzing the mechanical properties of glass particulates reinforced Aluminum Matrix Composites. Their exploration of glass as a reinforcement

material aligns with the durability aspect of glass highlighted in our study, although their emphasis is on mechanical properties in a different context.

Shakhgildyan et al. (2020) take a unique angle, portraying glass as the home of the periodic table. Their exploration showcases the versatility of glass in encapsulating various chemical elements. While distinct in its focus, it adds a layer to the narrative of glass as a remarkable material with diverse applications, echoing the essence of our study.

The comprehensive analysis of literature and expert insights contributes to a better understanding of the purpose and types of home glass accessories. The study sheds light on consumer preferences, sustainability considerations, and the broader market for glass accessories, benefiting both designers and consumers. However, further research could enhance these findings by exploring the nuances of consumer preferences and their impact on the market dynamics.

CONCLUSION

In conclusion, our study delved into the purpose and types of home glass accessories, emphasizing waste reduction through recycling and the development of sustainable products. Through a combination of literature review and expert interviews, we gained comprehensive insights into the multifaceted aspects of glass materials.

The literature review illuminated the versatility of glass, highlighting its attributes such as transparency, chemical inertness, environmental friendliness, availability, and affordability. While glass's sustainability and recyclability were emphasized, certain products like bottles and food containers were identified as contributors to waste generation. Our study, focusing specifically on home glass accessories, added a nuanced layer to the broader understanding of glass applications, emphasizing the intricate dynamics within this niche.

The interviews with consumers revealed key factors driving the choice of glass products, including transparency, chemical stability, decorative appeal, ease of cleaning, and sustainability. Common types of home glass accessories were identified, with lighting units and vases emerging as particularly popular categories. However, the study acknowledged a gap in explicitly addressing consumer preferences, suggesting a potential avenue for further research to delve deeper into the hierarchy of preferences among these characteristics.

Moreover, our study highlighted the importance of transparency and visibility in glass accessories, emphasizing their role in packaging beverages and food. Aesthetics and visual appeal were identified as significant factors, contributing to the overall aesthetic properties of architectural elements. The durability, longevity, and resistance to physical and chemical stresses of glass make it suitable for various applications, including food, beverage, and pharmaceutical containers.

Further research should delve deeper into understanding the hierarchy of consumer preferences among the identified characteristics of glass products. Investigating the nuanced factors that influence consumers' choices in home glass accessories would provide valuable insights for designers and manufacturers. While the study touched upon the sustainability and recyclability of glass, future research could extend the lifecycle analysis to include a more detailed examination of the environmental impact of specific types of home glass accessories. This would contribute to a more comprehensive understanding of the ecological footprint associated with different glass products. Building on the environmental focus, exploring innovative recycling techniques for home glass accessories could be an area of interest.

Investigating methods that enhance the recyclability of glass products, especially those with a shorter lifespan, could contribute to minimizing waste and promoting sustainable practices.

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The Application and Concept of the Theory of Five Colour in Ancient Chinese Urban Architecture

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ABSTRACT

This study explores the application and concept of the Theory of Five colours in ancient Chinese urban architectural design. Nowadays, urban colour has emerged as a crucial aspect of urban planning, carrying significant historical, cultural, and aesthetic information in the evolution of cities. Colour plays a symbolic role in expressing the character and quality of cities, with its impact evident in various aspects of human habitation and daily life. The conceptual analysis via on-site observation and secondary data delves into the historical shifts in architectural colour schemes for various periods, including the Warring States, the Qin Dynasty, the Han Dynasty, the Wei-Jin Northern and Southern Dynasties, and the Tang, Song, Ming, and Qing Dynasties. Through an analysis of the evolution of architectural colour across different historical eras, the finding reveals that the use of colour in ancient Chinese urban architecture was rooted in the traditional Theory of Five colours. Notably, red and yellow predominantly adorned noble, imperial, and religious structures, underscoring their esteemed and sacred significance. Conversely, colours like black, white, and green were prevalent in civilian constructions, emphasising the vibrancy and diversity of primary buildings through extensive use of neutral colours. This practice of colour differentiation contributed to distinctive regional variations within cities, reflecting a hierarchical architectural concept. However, with the passage of time and the disappearance of the hierarchical system, the application of colour in urban architecture became more flexible. Modern urban architecture, based on the foundation of ancient urban colour, exhibits diverse expressions according to factors such as cultural history, geographical location, and urban characteristics. As a result, the architectural landscapes of different cities display rich and varied colour palettes. These research findings will contribute as a significant reference value for the cultural connotations of ancient urban architecture and the colour design of modern urban spaces in China.

Keywords: *Ancient Chinese urban colour, Aesthetic, Historical, Cultural, Theory of five colours*

INTRODUCTION

Since the initiation of China's reform and opening-up policy, the country has undergone rapid social and economic development, leading to a significant increase in urbanisation and urban construction (Gu et al., 2012). While the expansion and modernization of cities have brought convenience and progress to people's lives, they have also had an impact on traditional urban patterns and appearances, resulting in a need for improvement in the quality of urban environments (Kai et al., 2023). The challenge lies in reconciling the rapid development of cities with the preservation of traditional landscapes and the enhancement of environmental quality, which has garnered significant attention.

One prominent issue in this urban development context is urban colour. Urban colour has emerged as a crucial aspect of urban planning, carrying significant historical, cultural, and aesthetic information in the evolution of cities (Wen et al., 2023). Colour plays a symbolic role in expressing the character and quality of cities, with its impact evident in various aspects of human habitation, daily life, and recreational activities (Jaglarz, 2023). However, with the accelerated urbanisation process, the issue of urban disease has become increasingly prominent, with the colour landscape of China's cities often appearing disorganised and disorderly (Wang et al., 2019). In response to this situation, Chinese urban planners have turned to foreign experiences and introduced urban colour planning theories to address the problem. The utilisation of colour in ancient Chinese architecture embodies a profound historical and cultural background. The evolution of colour usage in ancient Chinese architecture traverses various epochs (Wang & Qi, 2017). In primitive society, Chinese architecture gradually took shape, yet the understanding of colour remained limited, with only rudimentary concepts of primary colour and intermediate colour (Wang & Qi, 2017). Over time, the application of colour in ancient Chinese urban architecture became increasingly rich and sophisticated.

Starting in the Tang Dynasty, colour began to symbolise hierarchy and status, imposing strict regulations and constraints on their selection and application in architecture (Wang, 2017). In the Song Dynasty, colour became a mainstream feature, with architecture adorned in diverse and vibrant colour decorations, reflecting societal and cultural prosperity (Xiaoguang, 2018). The Yuan Dynasty witnessed a further proliferation of vibrant and colourful architectural hues, showcasing an opulent decorative style (Yan et al., 2023). In the Ming Dynasty, colour became more intense and visually pleasing, as bright colour schemes infused architecture with vitality and charm (Zhao, 2010). In the Qing Dynasty, the application of colour became even more intricate and delicate, with the prevalence of oil painting and colourful artwork in architecture showcasing a wide range of artistic expressions (Liu et al., 2019). Thus, this paper aims to explore the development and application of the Theory of Five colours in ancient Chinese urban architecture and elucidate the understanding and utilisation of colour during different historical periods.

LITERATURE REVIEW

Theory of Five Elements

The Theory of Five Elements, one of the most profound theories in Chinese traditional culture, has its origins traced back to the Xia and Shang dynasties and further developed during the Spring and Autumn periods. Its enduring influence continues to shape various aspects of Chinese society (Chen et al., 2019). The Theory of Five Elements has permeated ancient political systems, social culture, language, and other domains, exerting a far-reaching impact on the formation, development, and refinement of the Theory of Five Colour (Haferkamp & Neil, 1991). In ancient philosophical thinking, the Theory of Five Elements serves as a fundamental theoretical basis for the Theory of Five colours and stands as a

significant characteristic in shaping the aesthetic perspectives of traditional Chinese culture (Jian, 2018; Di, 2018).

The Origin of Wu Xing Theory - Materialistic Perspective

The true origin of Wu Xing's theory has been a subject of debate in academia. According to historical records, during the Yin and Shang dynasties, there existed the concept of associating the four seasons with the four cardinal directions, which further encompassed the notion of five directions (Huang, 2021). With the progression of history, feudalism and backwardness led to the emergence of worshipping deities, including the veneration of the Five Emperors. Both the worship and the understanding of directions were closely intertwined with the number "five" (Yang, 2008). Subsequently, various concepts emerged, such as the Five Chambers, Five Classics, Five Rites, Five Punishments, and Five Chapters, all of which intersected with the concept of "five" (Guo et al., 2017). This concept inherited historical perception provided the prerequisite conditions for the emergence of the Wu Xing theory. It is generally believed that the original Wu Xing theory can be traced back to the "Book of Documents: Hong Fan", which states, "The five elements are as follows: water, fire, wood, metal, and earth (Alexey, 2018). Water is moistening, fire is scorching, wood is bending, metal is altering, and earth is nurturing crops. Moistening creates saltiness, scorching creates bitterness, bending creates sourness, altering creates spiciness, and nurturing crops creates sweetness" (Jiang, 2024). The Hong Fan Wu Xing theory represented an initial understanding of the five substances, namely gold, wood, water, fire, and earth, based on their properties and tastes. It marked the beginning of ancient people's cognition of the surrounding world. The Hong Fan Wu Xing theory, as the rudimentary form of Wu Xing, reflected a simplistic materialistic perspective and embodied historical progress (Feng, 2020).

Subsequently, with the integration of Yin and Yang and the Wu Xing elements, the Wu Xing theory expanded from a comprehension of material substances to representing abstract meanings in explaining natural and social phenomena, continuing its development (Sun & Chen, 2018).

The Development of Wu Xing Theory - The Perspective of Abstraction

During the Warring States period, Wu Xing's theory ceased to exist as an independent line of thought and gradually merged with the Yin-Yang theory. The original Wu Xing theory was influenced by two theories: the concept of "qi" as formless vitality and the dynamic interaction of Yin and Yang (Wang et al., 2011). It gradually integrated with the Yin-Yang theory, giving rise to the concept of mutual generation and mutual restraint among the five elements. The combination of the Yin-Yang theory and Wu Xing theory formed a systematic and comprehensive theoretical framework known as the Yin-Yang Wu Xing theory, which played a crucial role in the future development of the theory of Five colours (Jiang, 2024; Li, 2020).

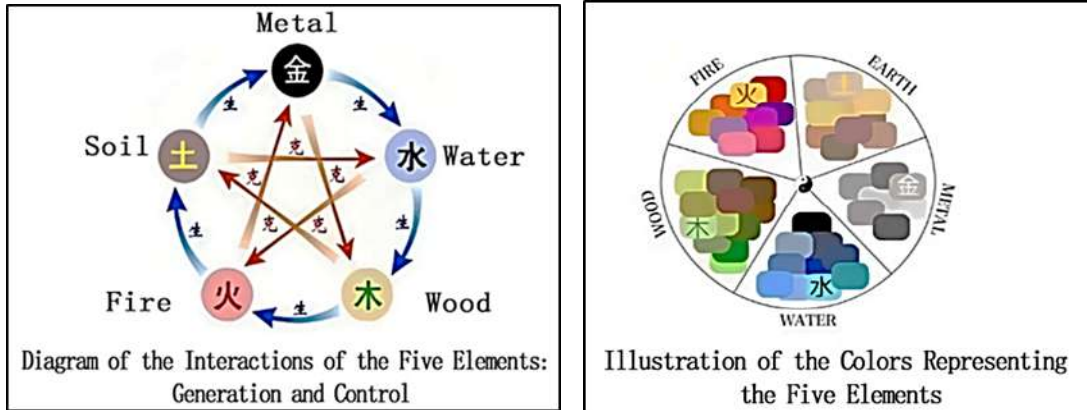


Figure 1. Diagram of the Interactions of the Five Elements: Generation and Restraint
(Source: Author's collection)

One of the most representative figures in this regard was Zou Yan, a Yin-Yang scholar from the state of Qi in the late Warring States period. Building upon the foundation of the original Wu Xing theory, Zou Yan further developed the concept of "the generation and conquest of the five elements" (Stephen, 2023). He proposed that "wood generates fire, fire generates earth, earth generates metal, metal generates water, and water generates wood," illustrating the mutually generative relationships among the five elements (Jiang, 2024) (Figure 1). On the other hand, "water conquers fire, fire conquers metal, metal conquers wood, wood conquers earth, and earth conquers water" represents the relationships of conquest and mutual restraint among the five elements (Skonicki, 2016). Zou Yan also put forth the theory of "the conquest of the Five Virtues," which explains the natural universe based on the relationships of conquest among the five elements (Nylan, 1996). He pointed out that human history also follows the pattern of "the conquest of the Five Virtues," characterised by the cyclic rise and fall of different virtues. This gave rise to the concept of the "beginning and end of the Five Virtues." According to Zou Yan, each virtue has its period of prosperity and decline, and the dominance of the Five Virtues governs the changes in history (Nylan, 1996). When a virtue flourishes, the corresponding dynasty prospers, and when a virtue declines, the corresponding dynasty declines (Kommonen, 2011).

The Refinement of the Five Elements System

Zou Yan integrated the theories of Yin-Yang and the Five Elements, establishing a connection between Yin-Yang and various phenomena. He utilised the dynamic Five Elements theory to explain the development and changes of these phenomena. As a result, the "Yin-Yang and Five Elements theory" permeated various fields such as astronomy, geography, politics, military affairs, traditional Chinese medicine, and economics (Lushchenko, 2018). Its most profound impact was in explaining the phenomenon of historical succession in human society. One notable concept that emerged was the "theory of perpetual change of the Five Virtues," which identified the Five Virtues associated with different eras, such as the Earth virtue representing the Yu era, symbolised by its yellow colour; Wood virtue representing the Xia era, symbolised by its green colour; Metal virtue representing the Yin era; and Fire virtue representing the Zhou era. Qin Shi Huang, influenced by these ideas, embraced the concept of "perpetual change of the Five Virtues" and declared himself as embodying the Fire virtue, proclaiming the current era as the beginning of the Water virtue, symbolised by its black colour (Liu et al., 2019; Liu, 1986). Successive emperors adhered to this belief system, implementing new calendars and changing the colour of vehicles, horses, and sacrificial animals during dynastic transitions.

During the Eastern Han dynasty, Emperor Wu abolished a hundred schools of thought, promoting Confucianism as the dominant ideology. To meet the demand for imperial authority and national unity, Dong Zhongshu, in his work "Gongyang Commentary," integrated Confucianism with the theories of Yin-Yang, Huang-Lao, and Legalism, forming a new school of thought known as New Confucianism (Ge, 2014). He combined Confucian philosophy with the Yin-Yang and Five Elements theory, proposing a series of comprehensive and detailed political and philosophical concepts, including "the harmonious interaction between heaven and humans," "the unity of heaven and humans," and "the three cardinal guides and the five constant virtues" (Table 1). The Yin-Yang and Five Elements theory, as an extensive theoretical system, not only classified static substances but also operated as a dynamic system characterised by perpetual change, cyclical patterns, and the interplay of generation and restraint. This system, in turn, guided human behaviour and historical development (Guo et al., 2022).

The table summarises the application of the "Five colours" concept within ancient Chinese urban architecture, incorporating the principles of the traditional Chinese Five Elements theory. It enumerates various categories associated with the five elements from the Five Elements theory, including Five Seasons, Five Planets, Five Organs, Five colours, Five Qi, Five Directions, Five Flavors, Five Positions, Five Tones, Five Emperors, Five Constants, Five Spirits, Five Temperaments, and Five Animals. The table is intended to elucidate how the Five Elements theory influenced various aspects of ancient Chinese urban architecture, encompassing considerations such as colour palettes, architectural layouts, material selections, and decorative elements.

Table 1: List of Corresponding Factors for Five Elements

No.	Authors and Date	Study topic	Categories	Elements				
				1st Option	2nd Option	3rd Option	4th Option	5th Option
1	Li et al., (2023); Di (2018)	The psychosomatic traits of "people with the five elements in traditional Chinese medicine": A qualitative study; Chinese Five Elements Conceptual Metaphors on Time and Space.	Five Elements	Wood	Fire	Earth	Metal	Water
2	Lai et al., (2018); Chen et al. (2019)	Window-opening behaviour in Chinese residential buildings across different climate zones; A method for exploring word-colour associations.	Five Seasons	Spring	Summer	Mid summer	Autumn	Winter
3	Bian, (2015)	Research on sustainable development of Urban colour based on new contextual-ism.	Five colours	Green	Red	Yellow	White	Black
4	Wu et al., (2015); Lidong & Guang (2021)	An ancient Chinese wisdom for metabolic engineering: Yin-Yang; Research on the Development Path of "Yin Yang and Five Elements" Cultural Creative Products Based on Cross-border E-commerce.	Five Qi	Dry	Yang	Harmony	Moist	Yin
5	Pei & Forêt, (2018); Di (2018)	Introduction to the Climate Records of Imperial China. Chinese Five Elements Conceptual Metaphors on Time and Space	Five Directions	East	South	Center	West	North

6	Li & Chao, (2021)	The combination of Chinese traditional pentatonic rhythm and new media art	Five Tones	Jue	Zhi	Gong	Shang	Yu
7	Langlois & Elman, (2001)	A Cultural History of Civil Examinations in Late Imperial China	Five Emperors	Tai	Yan	Huang	Shao Hao	Zhuan Xu
8	Matthews, (2017)	Making "Science" from "Superstition": Conceptions of Knowledge Legitimacy among Contemporary Yijing Diviners	Five Spirits	Jumang	Zhurong	Houtu	Rushou	Xuanming
9	Kim, (2022)	Zoomorphizing the asterisms: Indigenous interpretations of the twenty-eight lunar mansions in the history of china	Five Animals	Azure Dragon	Vermilion Bird	Yellow Dragon	White Tiger	Black Tortoise
10.	Gill & Huang, (2006)	Sources and limits of Chinese 'soft power'	Five Qi	Wind	Sun	Rain	Cloud	Cold

Theory of Five colour

The theory of the five colours originated from the labour and empirical observations of our ancestors regarding natural phenomena. Initially, it encompassed five fundamental colours: "(qīng) - blue/green, (chì) - red, (huáng) - yellow, (bái) - white, (hēi) - black," which vividly reflected the prevailing natural environment and the inner emotional responses of the people at that time (Luo, 2019). Subsequently, the theory of five colours integrated with the concepts of Yin-Yang and the Five Elements, thus acquiring the dynamic characteristics of mutual generation and conquest inherent in Yin-Yang and the Five Elements (Lidong & Guang, 2021). This amalgamation gave birth to an ancient philosophical paradigm and became a prominent aspect of traditional Chinese colour theory. In the course of this development, influenced by the Five Elements, a multitude of intermediate colours emerged, contributing to the enhanced maturity and refinement of the theory of five colours under the influence of ancient philosophical thought (Chen & Chu, 2022). Its profound impact extended across diverse domains of ancient people's lives, establishing it as the earliest formulated, most influential, and enduring colour system (Tang et al., 2017).

Formation of the Theory of Five colour

Throughout the history of human colour development, both technology and conceptual understanding have played significant roles in the recognition and application of colour (Pedigo & Krell, 2021). In primitive societies, humans began extracting the desired colour from plants, soil, minerals, and even animals. During the Neolithic period, advancements in refining techniques led to the production of more stable and purer colours. The sources of colour became more standardised during this time: hematite for red, manganese oxide coal for black, and clay for white (Thavapalan & Warburton, 2020). However, due to limited technological capabilities, the colour "(qīng)" could not be extracted during this period. Nevertheless, it is evident that the material and technological foundations established in primitive times contributed to the formation of the "Theory of Five colours." Conceptually, primitive humans were unfamiliar with nature and unable to explain natural phenomena. Consequently, concepts such as witchcraft and rituals emerged, leading to the veneration of monochromatic colour and the initial formation of the Theory of Five colours (Zhang, 2022). For instance, red was associated with fire and the

sun, yellow represented skin colour and the nurturing Yellow River, while the reverence for black and white originated from the perpetual transformations between day and night.

During the Xia, Shang, and Zhou periods, Chinese society transitioned to a slave system, and significant developments occurred in handicrafts and agriculture (Fu & Cao, 2019). With continuous improvements in knowledge and technology, colour applications became highly sophisticated during the Zhou dynasty. People eventually synthesised and summarised five fundamental colours from the complex array of colours: (chì) - red, (huáng) - yellow, (qīng) - blue/green, (bái) - white, and (hēi) – black (Gao & Sutrop, 2014). In the Warring States and Qin-Han periods, the merging of Yin-Yang and the Five Elements gave rise to the "Theory of Yin-Yang and the Five Elements." Subsequently, the theory of five colours was derived from the theory of yin-yang and the five elements. As history progressed, the Theory of Five colours underwent continuous refinement and gradually formed its system, becoming the "Theory of Five colour System" with distinct characteristics of traditional Chinese culture (Birdwhistell & Smith, 2016).

Development of the Five-colour Theory System: Emergence of Intermediate colour

As a part of the Yin-Yang and Five Elements theory, the Five-colour Theory system possesses the attributes of Yin-Yang and Five Elements (Yang et al., 2020). As mentioned earlier, the concept of "Five Elements generate and overcome each other", proposed by Zou Yan, was applied to explain the interactions and influences among various phenomena in the world. This concept also corresponds to the five basic colours in the Five-colour Theory, deriving a diverse range of "monochromatic" orientations through the principles of "generation" and "overcoming" (O'Connor, 2010). Tracing back to the pre-Qin period, people had already acquired certain knowledge of colour blending and coordination, and they put forth the concept of "primary colour" and "intermediate colour" in colour theory, stating that "qīng, chì, huáng, bái, hēi are the five primary colour, and lǜ, hóng, bì, zǐ, and huáng are the five intermediate colour" (Yang, 2020). This stage only included the five generative primary colours and ten overcoming mixed colours. By examining the descriptions of the five primary colours and ten intermediate colours in Xu Shen's "Shuowen Jiezi", one can observe the evolutionary pattern of colour in the ancient "Five-colour Theory system" (Wu, 2011). The fundamental five colours (primary colour) and ten intermediate colours derived from the theory of the generative and overcoming relationships among the Five Elements had already taken shape during the Han Dynasty. They were extensively applied, further refined, and established as a systematic study of colour. The refinement and establishment of the "Five-colour Theory system" marked the formation of aesthetic consciousness regarding colour in ancient China, acquiring new independent aesthetic concepts from primitive aesthetic views (Al-Humaiqani & Al-Ghamdi, 2022).

In addition to summarising the five primary colours and ten intermediate colours, ancient people also discovered variations in brightness and purity of colour, which were applied in dyeing fabrics (Cao & Fu, 2019). With technological advancements during the Han Dynasty, the colour of silk had evolved from the "five hues" of the pre-Qin period to the "seven colour", predating Newton's discovery of the "seven-colour spectrum" by over 1,600 years. As time progressed, particularly during the Tang and Song Dynasties, the variety and application of colour became highly abundant. According to the records in the "Xue Huan Xiu Pu" (Embroidery Patterns by Xue Huan) from the late Qing Dynasty, embroidery colour employed a combination of five primary colours and three intermediate colours, resulting in 88 mixed colours (Weichen, 2013). Furthermore, by manipulating the depth and shade of colour, a total of 745 different shades could be achieved, showcasing the pinnacle of colour development.

The Evolution of the Theory of Five colour

After becoming integrated into the Five Elements system, the theory of five colours was used to explain the influence of colour on various phenomena in the world. Among these, the most prominent is the "Theory of Five Virtues and Their Cycles" proposed by Zou Yan, which introduces the concepts of the cyclic nature of celestial principles and the perpetual presence of the five virtues (Inchauspe & Arakaki, 2023; Hu, 2015). During the reign of Emperor Gaozu of the Han Dynasty, Liu Bang established the Black Emperor Shrine, symbolising the Water virtue and designating black as the colour that counteracts water (Jian, 2018). Subsequently, during the reign of Emperor Wu of the Han Dynasty, under the influence of Confucianism and the theological thoughts of Dong Zhongshu, there was an emphasis on the central position of "Earth" in the Five Elements and the Five Directions (Zhao, 2015). Earth was likened to the fundamental element of all things. Hence, yellow became the symbolic colour of central imperial authority throughout different dynasties (Gao, 2016). From the Tang Dynasty onwards, yellow became exclusively reserved for the imperial family, further solidifying its status. During the Ming Dynasty, it was stipulated that black, yellow, and purple were the exclusive colours for the royal court (Tang et al., 2017).

Under the influence of the "Theory of Five Virtues and Their Cycles" and Confucianism, the entire nation embraced a specific colour and combined the hierarchical system with colour, resulting in a clear classification of colours that were originally equal. The ruling class directly associated this differentiation in colour with the national order, making the Five Colour System an absolute criterion that influenced ancient architecture, clothing, ceremonial objects, and other aspects of the ceremonial system (Cao & Fu, 2019). This criterion shaped social and ideological concepts in China from the Shang Dynasty to the late Qing Dynasty, influencing the development of traditional material civilization in China (Leese, 2012). In addition to its application in ceremonial systems, the influence of the theory of five colours is also evident in areas such as clothing, architecture, and murals.

RESEARCH METHODOLOGY

This study employs a qualitative method. The collection of primary data using on-site observation to explore the application of the Five-colour Theory in ancient Chinese urban architecture. On-site observation is the process of recognising and noting objects and getting the information. The information seeker is detached from the Five Colour Theory on the building being observed (Sharma, 2024; Salminen, 2001). This study investigates the application of the Five-colour Theory in ancient Chinese urban architecture. Primary data are the original data derived from your research endeavours, while secondary data are data derived from the review of primary data, the Five Colour Theory (Stewart, 2024). By collecting, analysing, and synthesising both secondary and primary data, a comprehensive understanding of the traditional application of the Five Colour Theory in ancient urban architecture will be revealed. The data encompasses ancient texts, historical records, architectural design manuals, and related research achievements. This approach enables a detailed examination of the application methods, principles, and significance of the Five Colour Theory in ancient Chinese urban architecture.

Field Study

A field study was conducted to observe and document the application of the Five Colour Theory in ancient urban architecture directly. Visits were made to ancient urban sites and existing ancient buildings, allowing for detailed observations and records of the practical application of the Five Colour Theory in China. The specific area is located around Beijing, Taiyuan, and Shanxi Provinces, which represent

ancient cities of China (Song, 2023). Through the field study, a deeper understanding of the methods and effects of the Five Colour Theory in actual architectural practice was gained. During the field study, careful observations were made regarding colour selection, pattern design, and decorative details of the buildings. Specific manifestations of the Five Colour Theory in Practical Architecture, including principles of colour coordination, symbolic meanings, and their correlation with architectural functions and styles, were recorded. The field study provided direct evidence and observational results of the actual application of the Five Colour Theory in ancient urban architecture. By integrating the approaches from secondary and primary data in the field study, this study enhances its credibility and depth, offering a comprehensive and accurate analysis of the application of the Five Colour Theory in ancient Chinese urban architecture. The secondary data establishes the theoretical foundation and builds upon previous research achievements, while the field study provides direct evidence and practical observations. Both data (secondary and primary) complement each other, ensuring a more comprehensive and reliable investigation.

RESULTS AND DISCUSSION

The theory of five colours, as a fundamental aspect of colour in ancient Chinese architecture, has had a profound impact on the application characteristics of colour in Chinese architectural history (Shi, 2020). The development of Chinese architecture can be traced back to its origins in primitive society, but it was during the Shang and Zhou dynasties that architectural development truly began. During this period, architecture started incorporating wooden beam structures, and buildings exhibited features of axial symmetry and rectilinear forms. In the Western Zhou period, people gained a certain understanding of zhengse (primary colour) and jianshe (intermediate colour) and identified five zhengse colours (qing, chi, huang, bai, hei) and five jianshe colours (gan, hong, piao, zi, liu huang) as representatives of different colour, which were formed by mixing the five zhengse colour. This period witnessed the emergence of a hierarchical system of colour, and the application of zhengse and jianshe colour gradually extended to architecture. The following Figure 2 shows the evolution of colour in ancient China.

During the Spring and Autumn and Warring States periods, the theory of five colours was combined with the theory of five elements, providing the five colours with a greater explanatory function (Feng, 2018). colour used in the roofs, pillars, and components of buildings carried specific meanings. Palaces commonly employ polychrome decorations, utilising colours such as red, green, yellow, grey, white, and black. After the unification of China by the Qin Dynasty, there was a trend towards standardised architectural styles, inheriting the rituals of the Warring States period and embracing the preference for black colour, as expressed in the saying "determining the supreme by distinguishing black and white." However, architectural colour schemes were not limited to black, and additional colours such as he, shiqing, shilü, and zhu hong were applied to architecture.

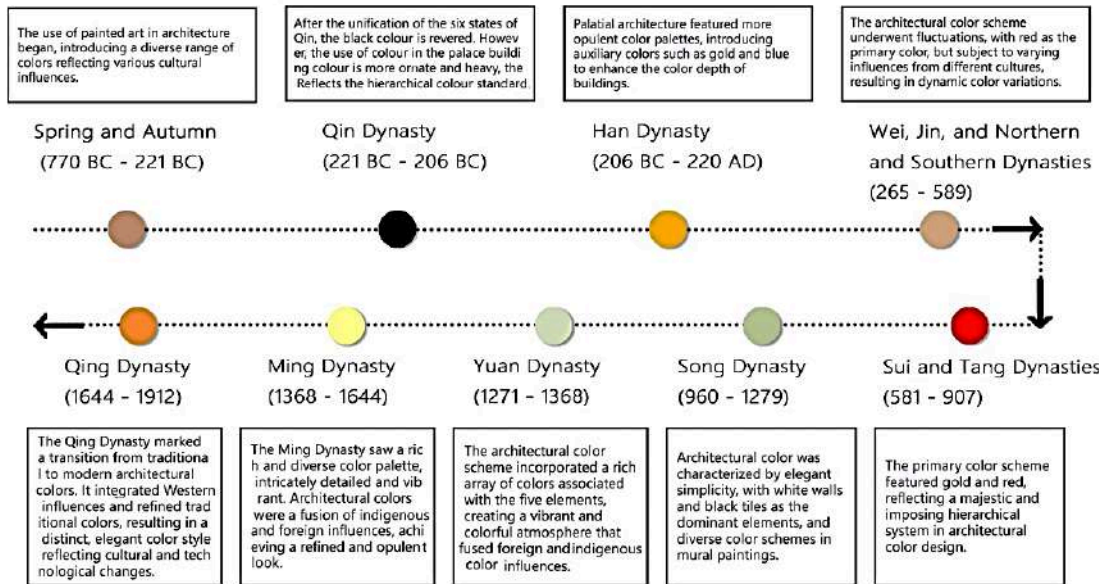


Figure 2. Schematic diagram of the evolution of architectural colours in the ancient Chinese era

During the Han Dynasty, architecture experienced significant development and gradual refinement. In terms of colour, ancient architecture inherited the traditional theory of five colours, which was derived from the Yin-Yang and Five Elements theory of the Zhou Dynasty. Each of the five colours represented different cardinal directions and possessed distinct symbolic meanings. Green symbolised the Azure Dragon of the east, red symbolised the Vermilion Bird of the south, white symbolised the White Tiger of the west, black symbolised the Black Tortoise of the north, and yellow symbolised the dragon, representing the centre (Tang et al., 2017). This ideology continued to influence architectural colour schemes until the end of the Qing Dynasty. Palaces and towers exhibited a wide variety of colours, with ceilings often adorned in shades of green, while columns and beams displayed hues of yellow, red, gold, and blue. Pillars and walls were typically painted in red or deep red. Conversely, folk architecture during the Han Dynasty commonly employed brick or mud and timber structures, featuring a more modest colour palette in the interiors (Zhou & Taylor, 2019).



Figure 3. Architecture of the Weiyang Palace (Han Dynasty) (left) and Dogwood Temple (Northern Wei) (right)

(Source: Marcie, 2015)

However, due to the dominance of Confucianism and the policy of "suppressing all other schools of thought and exclusively promoting Confucianism," there was a fusion of politics and religion, which strengthened imperial authority but also imposed limitations on intellectual freedom. Consequently, the artistic development of architectural colour was hindered, and further progress was impeded (Li, 2020). During the Wei, Jin, Northern, and Southern Dynasties, when Buddhism flourished, numerous Buddhist cultural structures were constructed. While vibrant and colourful pigments were used in artistic works such as Buddhist statues, the colour application in architecture itself was relatively simple and exhibited a more rustic style (Figure 3).

Tang Dynasty - colour Representation and Hierarchy

Prior to the Tang Dynasty, architectural styles were characterised by simplicity, with colour primarily reflecting the natural shades of materials. However, during the prosperous Tang period, influenced by Buddhism, there was a prevalent trend of opulence and extravagance, leading to the extensive use of colour as decorative elements in architecture. The application of colour was bold and rich, including vibrant reds, greens, blues, yellows, browns, and various gradations of blended colour. Additionally, gold and silver were employed as accent colours. Furthermore, the Tang architecture retained the traditional practices inherited from the Han Dynasty, such as the "vermilion columns and plain walls" and "white walls and red doorframes." The exposed parts of wooden structures were uniformly painted in vermilion red, while the wall surfaces were coated with white powder, creating a concise and vibrant appearance that was visually pleasing. Building Coupled with the plain clay foundations and rooftops against the backdrop of the blue sky and green trees, an atmosphere of simplicity, elegance, and reverence was achieved.

The Tang Dynasty was a pinnacle period in the development of Chinese architecture, characterised by unified planning under the jurisdiction of the "Rites Ministry." colour became a significant indicator of architectural hierarchy, serving to uphold the interests of the ruling class. Among the five colours, yellow was exclusively associated with the imperial family and symbolised their status. The combination of yellow and red hues was employed in the design of imperial palaces and temples (Figure 4), while red, blue, and green were reserved for the residences of nobles and high-ranking officials. Commoner dwellings were restricted to the use of black, grey, and white colours.



Figure 4. Tang Dynasty Architecture Qinglong Palace (left), and The Great Hall of the Buddha's Light Temple (right)
(Source: Cai, 2011)

Song Dynasty - colour Reflects the Mainstream

The Song Dynasty embraced a preference for simplicity and elegance, with emphasis placed on artistic taste. Influenced by the colour schemes of the Tang Dynasty, the Song Dynasty employed shades of green, vermilion, and gold for architectural decoration, complemented by the integrated use of white stone foundations, red walls, and yellow glazed roof tiles, resulting in a clear and composed colour palette. In addition, influenced by the philosophical ideas of Confucianism and Zen Buddhism during the Song Dynasty, the colour tones in architectural design and interior decoration pursued tranquillity and serenity, favouring understated, pure, and subtly refined hues.



Figure 5. Song Dynasty Architecture: Longxing Temple (left) and Top of Sanqing Guan (right)
(Source: Zhao, 2016)

On the other hand, since the Tang Dynasty, Buddhist culture and artistic forms have permeated various aspects of Chinese culture, leading to an increased emphasis on decorative details, colourful paintings, and intricate carvings in architecture. The combination of vibrant Buddhist colour and the serene tones favoured by Confucianism created a gentle and splendid impression in the architectural landscape of this era (Figure 5). The colour schemes in Song Dynasty architecture, influenced by the spiritual realm, fully reflected the mainstream culture of the time and held significant guiding significance for the subsequent development of Chinese architectural decorative culture.

Yuan Dynasty - colourful and Splendid Style

The Yuan Dynasty served as a transitional period between the architectural styles of the Song-Liao-Jin era and the Ming-Qing era. During this time, ethnic minority groups came to power in the Yuan Dynasty and launched military expeditions to the west, establishing a vast empire spanning Asia and Europe. As a result of cultural exchanges among different ethnic groups, architectural colour schemes exhibited a diverse range of styles (Figure 6). Despite this diversity, the orthodox position of Han Chinese architectural colour, based on the Five colour Theory, remained unshaken and continued to evolve during this period.



Figure 6. Yuan Dynasty Architecture, White Pagoda of Miao Ying Temple

(Source: Lou & Chen, 2002)

One of the most representative architectural achievements of the Yuan Dynasty was the Yuan Dadu (also known as Khanbaliq or Beijing). In "History of Chinese Architecture," it is recorded that this palace is magnificent and prosperous, surpassing any other in its layout. The roof tiles are red, yellow, green, blue, and other colours, glazed and shining like crystal. Even from a distance, the brilliance of this palace can be seen, indicating its durable and enduring nature. From this, it is evident that the colour artistry of Yuan Dynasty architecture achieved significant visual breakthroughs. The use of colour and patterns in architectural design became more exquisite, showcasing a beautiful and splendid style. The interior of buildings featured a rich array of colours, with red, yellow, blue, and green used for decorative paintings and embellishments.

Ming Dynasty - Rich and Pleasing colour

During the Ming Dynasty, the feudal autocratic system further strengthened the standardisation and typification of official-style architecture. In terms of architectural colour, the sunlit portions of imperial city buildings typically used vermilion red, while the shaded areas employed complementary cool colours such as blue and green, creating a pleasing contrast. The architectural style of Tibetan Buddhist temples in the Ming Dynasty also employed a contrasting approach, combining colours such as red, white, black, and brown to create strong colour contrasts that emphasised the significance of religious architecture. In residential buildings, colours were often derived from the inherent hues of materials, such as the bluish-grey bricks and tiles and the wooden structures of beams, doors, and windows, which contributed to an elegant aesthetic (Figure 7).



Figure 7. Yuan Dynasty Architecture, Gautama Temple (Ming)

(Source: Guo, 2019)

The urban planning, form, and colour schemes of Ming Dynasty city architecture laid the foundation for the development of Qing Dynasty city architecture. The present-day capital city of Beijing and the ancient city of Nanjing, which boasts the largest extant city wall in China, owe their layouts and development to the planning and management practices of the Ming Dynasty.

Qing Dynasty - Flourishing Painted Decoration

As the last feudal dynasty in ancient China, the Qing Dynasty unified a vast and multi-ethnic country, reaching the pinnacle of feudal autocracy. During this period, with national stability and continuous economic development, architectural art experienced its final peak, which had a profound and far-reaching impact, representing the image of modern China. In the Qing Dynasty, the imperial-style architecture, represented by the Forbidden City in Beijing, inherited the colour characteristics of the Yuan Dynasty, with red walls and yellow glazed roof tiles, while some palaces and temples had green roofs.



Figure 8. Yuan Dynasty Architecture Forbidden City (Qing) (left) and Temple of Heaven (Qing) (right)

(Source: Li, 2020)

The colours used in the imperial palace were the most vibrant, gradually decreasing in intensity for altars, tombs, and temples. Residential buildings in the Qing Dynasty featured simpler colours, with grey tones predominant in the north and pink walls, blue-green tiles, and brown lacquer harmonising with the lush green environment in the south. The entire city of Beijing employed a colour scheme to distinguish architectural hierarchy, skillfully applying the essence of the traditional theory of the Five colours (Figure 8).

Table 2: The evolutionary process of the Five-Color Theory in ancient Chinese urban architecture

No.	Period/ Dynasty	Five Elements	The evolutionary process of the Five-Color Theory in ancient Chinese				
			Wood	Fire	Earth	Metal	Water
1.	Wei Jin Southern and Northern Dynasties	Initial Development	Gradual emergence of wooden structure	Formation of preliminary colour system	Gradual development of architectural colour hierarchy	Colour begins to be symbolic with specific meanings	Expansion of colour palette, formation of a hierarchical system
2.	Tang Dynasty	Simple and Natural	Rich and colourful, influenced by Buddhism	Flourishing period with luxurious Colour	Red, green, blue, yellow, brown	Gold and silver embellishment , traditional practices	Blue accents

3.	Song Dynasty	Elegant Art	Influenced by Tang Dynasty colour	Clear and harmonious colour combinations	White, red, yellow	Black accents	Influenced by Confucianism and Buddhism, subtle and serene
4.	Yuan Dynasty	Breakthrough and Innovation	Colourful architecture	Grand palaces	Colours such as red, yellow, green, and blue	Gold accents	The rich internal colour palette
5.	Ming Dynasty	Elegant Aesthetics	Vermilion, blue, and green	Contrastive methods of warm and cool colour	Contrasts of red, white, black, and brown	Gold accents	Traditional five-colour theory
6.	Qing Dynasty	Inheritance and Development	Northern simple grey tones	Royal style architecture	Red walls, yellow tiles, green roofs	Grey tones in the north, multiple colours in the south	Blue accents

This table meticulously documents the evolutionary process of the Five-Color Theory in ancient Chinese urban architecture. Buildings from different periods showcase distinctive styles based on the Five Elements and Five Colors, reflecting the influences of various factors such as society, culture, and religion.

CONCLUSION

In summary, the colour palette of ancient Chinese urban architecture was governed by the traditional theory of Five colours. Red and yellow were reserved for noble, imperial, and temple structures, while other colours, such as black, white, and blue, were predominantly used in common residential buildings, creating a contrast between the vibrant colour of the main structures and the large areas of colourlessness. This category unintentionally resulted in distinct colour zones within the cities, reflecting the concept of hierarchy. Interestingly, red and yellow were the colours most often used to decorate aristocratic, imperial, and religious buildings, emphasising their sacred and revered status. On the other hand, neutral colours like black, white, and green were widely used in civilian construction, highlighting the vitality and diversity of main buildings. However, as time progressed and the hierarchical system disappeared, the application of colour became more liberalised. In modern urban architecture, the colour schemes of different cities' architectural landscapes vary based on cultural history, geographical location, and unique urban characteristics. These variations have departed from the foundation of ancient urban colour palettes, presenting diverse appearances in urban architectural landscapes.

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Application Of Natural Fibre Composites In Product Design: A Guiding Framework

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ABSTRACT

The global production of petroleum-based plastics has grown significantly from 1.5 million tonnes in 1950 to 367 million tonnes in 2020, escalating global demand based on the limitations of conventional material resources. The effective use of natural fibre composites can alleviate modern civilisation's reliance on chemical resources, reduce energy shortages and have a positive impact on agricultural development. The objective of this study is to establish a framework for guiding design practice by sorting out the properties and application areas of natural fibre composites from a designer's perspective, and the ways in which the material can be experienced. It also uses coconut fibre as an example to develop design research and promote social innovation. The data is analysed and summarised through theoretical frameworks, qualitative interviews, observations and thematic analysis. Facing new materials outside the education system, it helps design-related staff to find areas of application where material properties are consistent with product properties, consumer needs and environmentally beneficial in the design practice process.

Keywords: *Natural fibre composite, Product innovation, Sustainable applications*

INTRODUCTION

Materials have always been a focus of sustainable design concerns and the introduction of materials can be seen as a sustainable expression in itself. The green economy points to an employment policy that stimulates innovation through access to the right resources and promotes the recycling of existing products rather than the reuse of new ones, with a focus on reducing petroleum-based products through the use of a circular economy. A shift from the previous linear economy of 'extract, produce, use and discard' to a continuous cycle model of products. This has led to the development of a range of new materials and this paper looks at the use of biodegradable biomass-natural fibre composites in product design.

The world has entered the "post-oil era" as a result of excessive energy consumption. On the one hand, the limitations of conventional-based material resources are escalating global demand and significantly increasing the price of raw materials. On the other hand, the recycling rate of plastic waste

worldwide is still extremely low, with millions of tonnes of plastic waste being disposed of in the natural environment, including between 75 and 199 million tonnes in marine ecosystems (UNEP - UN Environment Programme, n.d.). In response to resource constraints and the plastic crisis, society is urgently seeking renewable resources to "replace" petroleum-based materials.

The "biodegradable biomass feedstock" (plants, animals, microorganisms, organic waste) is a hot topic of research. There are more than 2000 different plant fibres in the world (Väisänen et al., 2017). Natural plant fibres exist in plants in many forms such as bark, stems, leaves and seeds, and are the largest renewable resource in the earth's biological resources. Natural plant fibre composites are one of the new degradable biomass materials, but natural plant fibres, a sustainable biomass resource, are not fully utilised.

With the general increase in environmental awareness and technological developments, natural fibre composite products already exist in everyday household products, such as disposable bagasse bioplastic tableware and straw tableware. However, industry statistics show that these biocomposites are still not comparable to traditional materials in terms of market share (Dicker et al., 2014; Manu et al., 2022). Designers have expressed unfamiliarity when working with these materials (Taekema & Karana, n.d.). Consumers also report that traditional materials are more familiar and secure, and despite being aware of environmental issues, they prefer to buy cheaper, familiar products rather than pay extra for expensive but environmentally friendly ones. What's more, some of these products are only as "environmentally friendly" as they sound (Dunn et al., 2020). It is clear that biocomposites have not yet made a positive impression on consumers.

LITERATURE REVIEW

Natural fibres are made up of plants and animals, minerals, which are readily available, biodegradable and have biocompatible properties (Syduzzaman et al., 2020; Väisänen et al., 2017a). The present study is concerned with plant fibres in ten fibre composites.

Plant fibres

Plant fibres generally refer to agricultural and forestry residues containing wood fibres, including hemp fibres, bamboo fibres, wood flour, wheat straw, corn straw, bagasse, rice husks, etc. It has the characteristics of abundant source, low price, renewable, degradable, low processing cost, etc (Cheng et al., 2020). The disadvantages of vegetable fibres are their high hydrophilicity and water absorption, which affects their mechanical properties (Uppal et al., 2022). Plant fibres are mainly composed of cellulose, hemicellulose and lignin (lignocellulose) (Singha & Thakur, 2009). According to the application, plant fibres are classified as primary or secondary, with primary plants being those produced for their fibre content and secondary plants being those that produce fibre as a by-product (Summerscales et al., 2010). The age of the plant, the species, the climatic conditions and the fibre processing techniques affect the chemical composition and structure of the fibres. There are six types of cellulose fibre. These are bast fibres, leaf fibres, seed fibres, stem/grass fibres (Barba et al., 2020; Li et al., 2020; Thakur et al., 2011).

Classification of plant fibres

The bast fibres, also known as soft fibres, are located beneath the epidermis of the stem (Zhuang, 2001). The main bast fibre plants are jute (*Corchorus cap sularis*), flax (*Linum vsitatissinum*), red hemp (*Hibiscus cannabinus*), hemp (*Cannabis sativa*), ramie (*Boehmeria nivea*) (Chandramohan & Marimuthu, 2011; Li et al., 2020; Zhuang, 2001). The bast fibre has excellent properties in structural applications, is strong and easy to extract. The fibres can be separated from the main stem, usually by maceration, and the

separated fibre bundles can often be used directly and have been used since ancient times to make rope, hemp stuffing, packaging materials, etc. Jute fibre is the cheapest bast fibre after cotton (Uppal et al., 2022) and has the highest yield of all in the world (Shahzad, 2012) and is widely used. Flax is also a favourite for everyday use. Widely used for its lightweight, high cellulose content (62-72%) and optimum combination of strength and stiffness, flax can be spun into high-grade yarns, fine linen and other textile products, and also as a reinforcing material in composite materials. Ramie is the stiffest of all bast fibres, as it has the highest cellulose content, but has been relatively little studied due to its lowest production. Nowadays, bast fibres are mainly used in the textile industry and as reinforcement for composite materials.

Leaf fibres, also known as stiff fibres (Zhuang, 2001), are fibres obtained from the leaves or leaf sheaths of plants. Leaf fibres are coarser than bast fibres. They have good strength and mechanical properties and are widely used in composites and are also synthesised into natural fibre composites for exterior and interior automotive applications as a reinforcing material. The main leaf fibres are sisal (*Agave sisalana*), banana (*Musa indica*), pineapple (*Ananas comosus*), Abaca (*Musa textilis*), Curaua (*Ananas erectifolius*), of which plantain hemp, sisal is more widely used. Jute fibre is now used to make bags, boxes, mats and other products with high strength.

Seed fibres are seed epidermal hairs, which are single-celled fibres produced by the epidermal cells of some plants, mainly cotton (*Gossypium*), coconut (*Cocos nucifera*), oil palm (*Elaeis guineensis*). The most familiar is cotton fibre (Zhuang, 2001). which can be used in a wide range of applications and forms, from inexpensive textile products to a variety of high-value products. Cotton can also be used as a reinforcing material in tea-cotton based composites for automotive applications. Coconut is the least absorbent and relatively water resistant of all plant fibres. The low water absorption of coconut fibre is due to the low cellulose content and high lignin content, and it is for this reason that the mechanical properties are low and batch production is challenging (Geethamma & Thomas, 2005).

Stem/grass fibres refer to straw fibres, mainly sugarcane bagasse (*Saccharum officinarum*), bamboo (*Bambusa vulgaris*) barley and rice. Compared to bast and leaf fibres, sugarcane fibres are the shortest, less brittle and have the lowest tensile rates (Hajiha & Sain, 2015). Compared to bast and leaf fibres, this fibre has lower tensile properties and is mainly used for making pulp. Panels made from bamboo fibres are hard and stiff and can be an effective substitute for hardwood items. And bamboo fibre absorbs different frequencies of UV light, making it a very useful fibre and a quality alternative to wood. However, the mechanical properties of stem fibres are generally poorer materials compared to bast and leaf fibres, and are often used to make disposable tableware and packaging materials.

Natural fibre composites

Natural plant fibres can be processed into threads for weaving and textile production (Mohanty et al., 2018), It can also be chopped as a filler, reinforcement and binder (matrix) to form natural fibre composites (Rognoli et al., n.d.). Natural fibres (NF) are one of the most commonly used green fillers or reinforcing agents in polymer matrices. Natural fibres are embedded in thermoset or thermoplastic polymers to create composites (Mohammed et al., 2015).

With the advantages of being cheaper than synthetic composites, biodegradable, resourceful, renewable and lightweight, natural fibre composites are being used as an alternative to petroleum-based materials (Elanchezian et al., 2018; Li et al., 2020; Safri et al., 2018). Scholars in different contexts have modified the properties of materials to suit different applications, such as adding reinforcements (in the form of fibres or particles) to form different composites, such as natural fibre-reinforced composites (NFRC), 100% green biocomposites - plant-based natural fibre-reinforced composites (PFRPC), and plant-based natural fibre-reinforced composites (PFRPC). Natural fibre reinforced composites (NFRC), 100% green biocomposites - Plant-Based Natural Fiber Reinforced Composites, and natural fibre reinforced polymer composites (NFRPC), are now considered to be one of the most emerging materials

for many engineering applications. NFRC is also known as "green composites", "eco-composites" and "bio-composites".

Natural fibre composites in household products

Natural plant fibres are commonly found in the textile and paper industries and are also used in everyday products such as rope, mattresses and planting soil. Natural fibre-reinforced composites (NFRC) are now considered to be one of the most emerging materials for many engineering applications. The most prominent of these are automotive parts, aerospace, architectural panels and medical applications (Mohan & Kanny, 2012; Uppal et al., 2022; Zhao, 2022). However, this sector is more concerned with technology than with aesthetics. In the textile industry, plant fibres are used more widely and are concerned with aesthetics, often woven into threads for fabrics, clothing, shoes and bags. Natural fibre composites are also used in clothing accessories such as buttons and zips, and on the bottoms of shoes. Natural fibre composites are used in everyday products as an alternative to petroleum-based materials, in tableware, disposable products and disposable packaging materials.

Natural fibre reinforced composites are used extensively in the automotive industry for their high strength and light weight (Figure1), especially in European countries where government legislation encourages the use of natural fibres in 'end-of-life vehicle regulations' (Li et al., 2020). In automotive components, the main solution is to reduce the total weight of the vehicle, reduce costs and improve fuel efficiency (Naik & Kumar, 2021). For example, the Mercedes-Benz A-Class (2018 model) has components made of natural fibre composites that reduce the weight of the vehicle by up to 34% (Fantuzzi et al., 2021), achieves a high level of material utilisation (Barba et al., 2020). Other leading car manufacturers such as BMW Audi Fiat, GM, Honda, Volvo, Mazda Kai, Toyota and Volkswagen are also incorporating natural fibre composites into their products (Li et al., 2020). However, consumer demand for such products is mainly for technological improvements, with very little demand for interaction and styling, and the sector is more concerned with the technical aspects of sustainability than with the aesthetics of materials.



Figure 1. Model of the Mercedes-Benz A-class car and its component parts made of natural fibre composite

(Source: Barba et al., 2020; Mercedes-Benz Sustainability Dialogue 2022, 2022)

In addition to the above-mentioned use of NFC in the automotive sector, NFC is also often used to make panels, which is the most common way of exploring the initial application of the material in a flat form to explore how the material can be formed. It is of great significance to explore NFC forming in a flat form. Flat panels are used in a wide range of styles, such as veneer, laminate, and panels of different thicknesses can be used in architectural interiors, interiors, furniture, and product design. The emergence of panel furniture allows for modular assembly, freedom of assembly while saving transport space and reducing the weight of the product. Banana fibre FIBandco veneers from the Banana trunk veneer brand -

the green blade® range (Veneer–Fibandco, n.d.) are used in various forms in architecture, interior spaces, furniture design and product design (Figure 2). It is worth noting that this brand of material is already on the market and has been awarded LEED certification. Natural plant-based panels can replace wood and plastic panels, reducing the strain on wood and oil resources.



Figure2. FIBandco- green blade® banana fibre veneer in design
(Source: Veneer – Fibandco, n.d.)

NFC is gradually replacing disposable packaging for disposable products (Nor Salwa. et al., 2021) and tableware (Sathish et al., 2021) in the application trend. Plant fibres can be made into pulp and pressed into everyday items, such as paper cutlery. However, mankind's reliance on paper-based products has led to the over-consumption of wood resources. Waste plant fibre materials such as wheat straw can be pulped and also combined with a matrix to form composite materials such as wheat straw plastic. wheat straw plastic is very durable and heat resistant, withstanding temperatures of up to 200 degrees Fahrenheit, and is therefore often used as an alternative to plastic for everyday household items. Similarly, bagasse, a straw fibre material, is also made into biodegradable plastics for a range of dishes, cutlery, cups and plates (Figure 3).



Figure 3 : Sugarcane bagasse bioplastic tableware
(Source: Compostable Bagasse Plate Supplier In China-GangXuan, 2022)

Compared to plastic, metal, glass and wood, plant fibre composites are relatively less used in product design. Natural fibre composites are used as an alternative to plastics in the field of disposable packaging materials and filling materials. In some respects natural fibre composites can be similar to other materials in terms of physical and chemical properties. However, consumers have their own impressions, emotions and expectations of familiar materials that are difficult to meet.

Products Material properties and product properties

In *the Material of Invention*, Manzini (1986) stressed that the primary characteristic of new materials is their functionality. Instead of asking "What is it?" When referring to a newly familiar material, the designer needs to ask "What does it do?" What are the properties of the material and for what area and function is it suitable? This is considered to be one of the most powerful strategies for reducing the gestation time of material innovations (Ashby & Johnson, 2003). Material selection in product design is defined as the selection of suitable materials for a designed product by considering relevant design criteria such as manufacturing process, availability, cost, function, shape, use, etc (Karana

et al., 2010). In product design, materials should not only meet technical requirements, but also appeal to the user's senses and contribute to the intended meaning of the product (Ashby & Johnson, 2003). It is the responsibility of the product designer to consider the relationship between material properties and product characteristics in order to use materials to effectively convey certain meanings.

The consistency of material properties with product properties can also have a significant impact on the environment, for example, plastics can cause irreversible damage to the environment not because they have environmentally unfriendly properties, but because humans have given long-lived materials short-lived features. Similarly, natural fibre composites, although naturally harmless, renewable and biodegradable, can also be harmful to the environment if they are given functions that are inconsistent with the material's properties.

Material properties

In 2009 Karana summarised 'material properties' as technical and sensory properties of materials, where technical properties of materials (strength, elasticity, thermal conductivity, etc.) are used to differentiate materials, e.g. the technical characteristics of glass - transparent, brittle materials (Karana, 2009). The sensory experience is a multiplicity of sensations that are triggered by the human experience of the material, e.g. the "brightness" of the glass is inspired by its "transparency" and "brittleness". "light", "fragile", etc. The properties of a material include both the physical and chemical technical characteristics of the object and the feelings that are evoked during the experience of the material.

2015 Karen's study of the literature has inspired a hierarchical model of material properties (Figure 4), which divides material properties into two categories-physical properties and 'experiential characteristics'. physical properties correspond to the physical-chemical properties of materials, while experiential characteristics correspond to experience-oriented and user-driven material properties, including sensory, associative and emotional characteristics. The senses are the bridge between physical properties and 'experiential characteristics'. Technical properties of materials interact with sensory, associative and emotional properties (Hasling, 2015).

(11pt space)

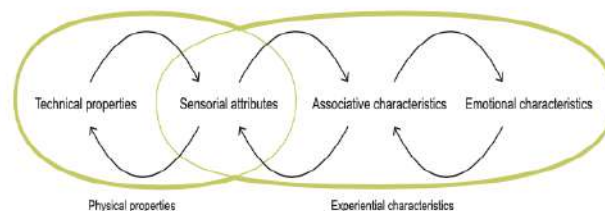


Figure 4. Hierarchical model of material properties
(Source: Hasling, 2015)

Product properties

Product characteristics refer to the product's function, form, people who use it and how it interacts. The physical and chemical properties of the material have a direct influence on the function, surface treatment and interaction of the product, while the emotional needs of the consumer also have an impact on it. This means that a product that works, works well and is loved must satisfy both the material and emotional functions of the product.

The form, colour and texture of the product also influence the sensory experience of the person, who in the process of experiencing it will stimulate/create associations and thus emotions towards the product. How to capture/create associations and emotions inspired by the interaction between the technical and sensory properties of materials is a key concern for product designers.

METHODOLOGY

This study focuses on natural fibre composites made from mainly plant fibres. Knowledge generated in practice through theoretical frameworks, material experiments, qualitative interviews to collect data. The data is grouped and coded by transcribing the text from the recordings and processed through thematic analysis methods.

Theoretical framework

The following guiding framework for design practice for this study (Figure 4) was developed based on the material-driven design approach (Karana et al., 2015). The guiding framework for design practice for natural fibre composites focuses on the transformation of form, function, and interactive experience between material properties, product properties, uncovering the unique properties of the material, capturing factors that touch consumer empathy, how to enhance the recognisability, acceptability of natural fibre composites, and expanding the direction of application areas consistent with the material properties. To help design-related workers realise the value of materials in their design practice and promote social innovation.

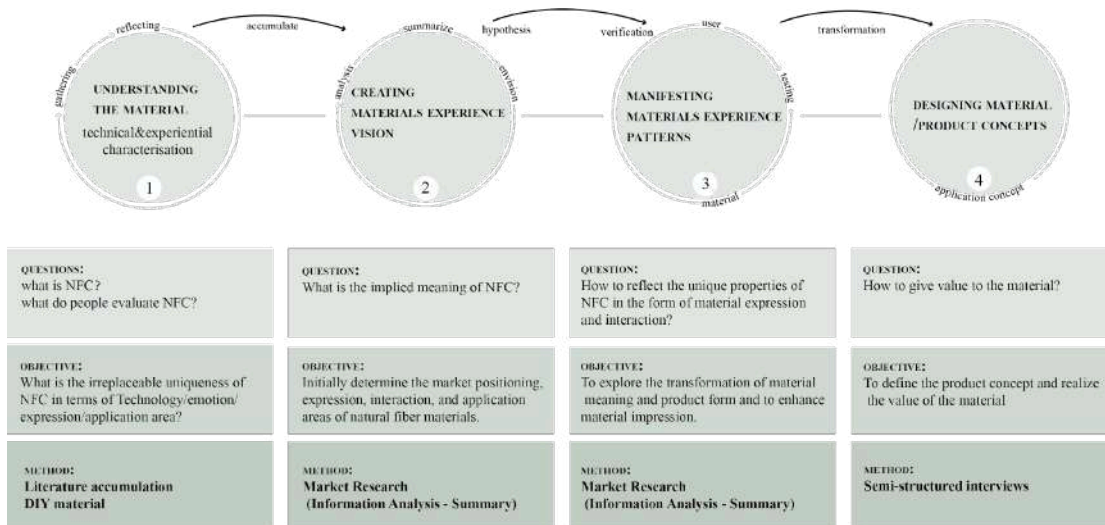


Figure 4. A guiding framework for the design practice of natural fibre composites

Step 1: Understanding the material (technical & experiential characterization)

Through the accumulation of existing literature, what are the unique characteristics of natural fibre composites that are irreplaceable in terms of technical/emotional/expressive form/application areas? The main questions revolve around the following (Table1):

Table 1. Step 1 key Issues

1: What are the main technical characteristics of plant fibre composites? (strength, permeability, water absorption)?
2: What are the drawbacks of plant fibre composites?
3: How are plant fibre composites formed?
4: What do people say about plant fibre composites?
5: How do people interact with plant fibre composites?
6: What are the main areas of application for plant fibre composites?
7: What are the main areas of application for bio-based materials?
8: How do these natural fibre composite products now reflect the material characteristics?

Step 2 : Creating Materials experience vision

The literature research and the analysis of market data initially predicts the market positioning, presentation, interaction and application areas of plant fibre composites, and summarises them in a visual image. The main focus is on what is implied by plant fibre composites (Table2):

Table 2. Step 2 key Issues

1: Envisioning the field of application of the material
2: Imagining the way people and materials interact
3: Envision the emotions that people evoke as they experience the material
4: What factors (fibres/cultural symbols/methods of use/etc.) are envisaged to influence the emotional characteristics evoked by a person during the experience of the material?
5: What kind of representation do the envisaged materials take in the product?
6: What emotional characteristics are evoked by the envisaged presentation of the material?

Step 3 : Manifesting Materials Experience Patterns

The transformation of data analysis and elements explore the transformation of material meaning and product form to enhance the impression of the material. This is developed around the following questions (Table 3):

Table 3. Step 3 key Issues

1: What factors influence human behaviour during the experience of material?
2: What factors influence the emotional characteristics that a person evokes during the experience of the material?
3: How do you translate emotional characteristics into design elements?
4: What emotional changes are stimulated by changes in the presentation of materials?
5: How can the unique properties of the material be reflected in the form of expression?
6: How can we enhance consumers' emotional identification with the material in terms of its presentation and interaction?

Step 4 : Designing Material/Product concepts

Semi-structured interviews with people working in the field, combined with material samples and design proposals (sketches of intentions, models), generate knowledge and refine concepts through construction, reflection and exchange. This leads to the expansion of the field of application and the realisation of the value of the material. The following questions were developed (Table 4):

Table 4. Step 4 key Issues

1:Positioning of materials/products (function, population)
2:What are the areas of application of the materials, how they interact, how they are presented, and whether they meet the needs of the consumer?
3:Are the technical characteristics of the material consistent with the function and lifetime of the product?

Material experiments

Data on material properties such as strength and tensile strength can help designers to understand whether the material properties meet the performance requirements of the product. But in design practice theoretical data is difficult to stimulate emotional perception. Designers need to feel the material with their hands, experience it and combine theory with practice.

In this study, coconut fibres were selected for the material experience. The material experiment focused on the variation of the 'fibre degree' after the matrix (binder) was determined, with the variation of the length, thickness and number of fibres resulting in different sample forms being experienced. The natural binder used here is made from gelatine, glycerin and fermented milk, a ratio obtained from the Product Design Studio of Zhejiang Normal University, China.

The materials experiment plan (Figure 5) looks at different types of binder, different proportions of binder, different fibre forms, and different proportions of fibre forms. For example, 5g of corrugated paper was combined with 3g, 5g, 10g, 15g, 20g, 25g, 30g of long & fine fibre to produce 6 material samples, and so on to produce more than 114 samples for the whole experiment. Using "material strength", "material characteristics", and "fibre size" as selection indicators, 12 representative samples were selected for the next step of the study.

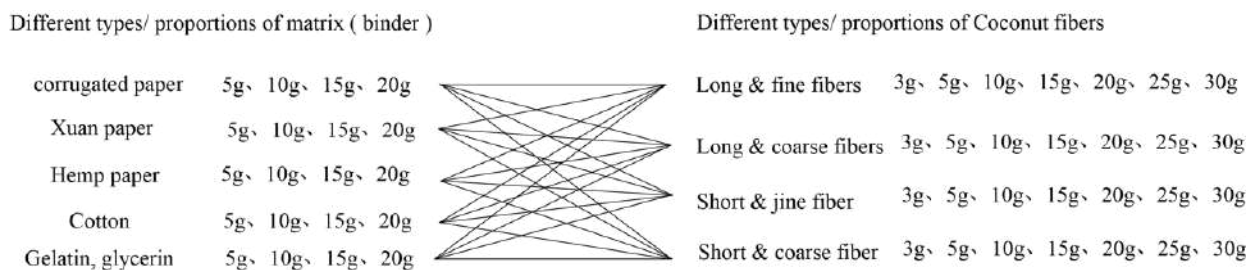














Figure 5. Materials Experimentation Programme

Semi-structured interviews

The interviews were conducted in Jinhua, Zhejiang Province, China, with a total of 15 interviewees who were junior designers, senior designers and material experts. The researcher conducted 1-to-1 interviews with 12 material samples (Table 5) and recorded the entire interview with the consent of the interviewees. The samples were observed and touched through visual and tactile means, and the interviewees were encouraged to interact with the materials in a variety of ways such as touching, folding, tearing and smelling. The interviewees were also encouraged to observe the samples under different light sources in order to obtain sensory perceptions, evaluations, impressions and associations during the material experience on the one hand, and to explore the application areas of the material together with the interviewees on the other.

Table 5. 12 sets of sample materials

Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6
					
10g corrugated paper: 10g coconut fibre (long fibre)	10g xuan paper: 10g coconut fibre (long fibre)	20g corrugated paper: 10g coconut fibre (staple fibre)	20g corrugated paper: 10g coconut fibre (short fibre)	1g coconut fibre residue (coarse fibre): 5g natural binder	1g of coconut fibre residue (fine fibre): 5g of natural binder
Sample 7	Sample 8	Sample 9	Sample 10	Sample 11	Sample 12
					
0.7g coconut fibre residue (fine fibre): 5g natural binder (dyeing)	0.5g coconut fibre residue (fine fibre): 5g natural binder (dyeing)	5g of coconut fibre (short & fine): 5g of natural binder	5g of coconut fibre (short & coarse): 5g of natural binder	5g of coconut fibre (long & thin): 5g of natural binder	5g of coconut fibre (long & thick): 5g of natural binder

Data analysis

The material samples are mainly divided into coconut fibre paper and coconut fibre bioplastic. Coconut fibre paper has the characteristics of paper, light transmission, weakness, fear of water, bendable but tearable, with the addition of coconut fibre the paper is tougher than ordinary paper and has a unique fibre aesthetic under light, especially the short fibres. Coconut fibre bioplastics, with very good strength can be adapted to different functions. The long fibre samples, in particular, retain the strength of the material and at the same time have a unique fibre aesthetic and breathability.

Respondents subconsciously touched and bent the samples when they first touched them, and had no obvious requirements for the smell of the samples. The material samples were rated positively as "natural", "original", "safe" and "approachable". There were also negative comments such as "low quality", "brash" and "poor finish". The men in the study valued the sturdiness of the samples, tried to rip and tear them, and preferred the tougher samples. Women were more concerned with the texture, pattern and feel of the material.

Respondents felt that the coconut fibre material samples were natural and environmentally friendly, with natural materials that gave a feeling of safety. However, respondents also raised concerns about the stability of the material and whether the purely natural material would be able to cope with changes in temperature and humidity. In terms of application direction respondents were concerned about the aesthetic changes of fibres under light, the biodegradable nature of the material and the creation of natural ambience in the space. Further thematic analysis was carried out by summarising the following six groups of high frequency keywords: tactility, fibre sense, softness, toughness, texture, colour and stability.

Design applications

Through design practice and data analysis, the three keywords that cannot be replaced by natural fibre composites are "fibre degree", "air permeability" and "vitality". The design of coconut fibre composites in the field of planting and nursery is proposed to explore the application direction. Coconut fibre has moderate strength, low water absorption and high water fixation, and it can adjust the ratio of acidity to alkalinity in the soil, making it very easy for plants to grow.

Coconut fibre seedling trays (Figure 6), on the one hand, provide seedlings with an airy, water-fixing environment, and when the seedlings grow up they can be transplanted into the soil along with the plants to fertilise the soil again with fertiliser. A natural cycle of material from cradle to cradle is achieved.



Figure 6. Coconut fibre seedling trays
(Source: Author's collection)

RESULTS AND DISCUSSION

Natural fibre composites are made from plant fibres of natural origin, which are renewable, biodegradable and have the plasticity of plastic, and have great potential to ease the strain on petroleum-based resources. The current use of natural fibre composites in the automotive and construction sectors is widespread, but the focus on the technology of the material rather than the aesthetics of the material and the application of the material in design has made it clear that, compared to traditional materials, natural fibre composites are less commonly used in everyday products and are less distinguishable. This study establishes a framework for guiding design practice with natural fibre composites and proposes to explore the material from a designer's perspective, in terms of material aesthetics, application areas, ways of human interaction with the material, and material meaning.

Plant fibres are of natural origin, renewable and biodegradable, but do not necessarily retain their "ecological properties" when made into composites, as the binder in the composite is not necessarily a "green matrix". At the end of a product's life, recycling is also far more complex and difficult than we might think, and unconditional degradability is difficult to achieve. Design practitioners also need to look at the binder of the material at an early stage of design practice, the legislation governing the application area and whether the conditions for recycling and biodegradability are met at the end of the product's life. Designers should take a critical look at the 'green' and 'eco-friendly' labels attached to such materials and incorporate sustainability assessment strategies at an early stage of design practice.

CONCLUSIONS

"Natural" is a characteristic that distinguishes natural fibre composites from other materials (Karana & Nijkamp, 2014; Rognoli et al., n.d.). But all natural materials can be 'natural' without over-treatment. The mention of natural fibre composites is hardly evocative, the material is poorly differentiated and the material has a single application area. The design practice of natural fibre composites guides the framework, helping designers to confront new materials outside the education system and to develop design projects based on material properties. To drive the diverse use of materials, explore the many possibilities of application areas and promote social innovation.

Society has tended to replace petroleum-based materials with 'environmentally friendly' materials, This is not the design approach encouraged by this study. No material is good or bad. plastics are causing irreversible damage to the environment because society has given long-life material properties to short-life products. Purely natural materials used in the wrong areas can also be harmful to the environment. Purely natural synthetic materials are susceptible to changes in temperature and humidity, and the short life span of materials and biodegradable properties require certain conditions to be met in order to achieve them. Designers need to be aware of the relationship between the environment and the economy and, in this regard, focus groups are needed to systematically assess the sustainability of material applications with stakeholders.

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Exploration of Fine Art Photography as a Medium for Self-Expression

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ABSTRACT

The purpose of this study is to investigate the ethics of fine art photography through the lens of self-expression. Specifically, the study focuses on privacy, permission, and the creative utilisation of human experiences. My ability to express myself through photography could be beneficial. Using both observation and case studies, we investigate how the influence of fine art photography on self-expression arises. People are able to visually represent their thoughts, feelings, and experiences through the medium of fine art photography, which also alters their self-expression and contributes to the process of self-discovery. Through the use of high art photography, this research evokes feelings and recollections. The composition, lighting, subject matter, and post-processing techniques all contribute to the creation of well-considered photos. Within the realm of fine art photography, this study promotes the exploration of self-expression through the creation of photographs that generate feelings, conversations, and identities.

Keywords: *Fine art, Photography, Self-expression, Self-discovery*

INTRODUCTION

Fine art photography has long been acknowledged as a powerful form of artistic expression, allowing individuals to capture and communicate their innermost thoughts, feelings, and experiences through visual imagery. The importance of personal identity exploration and self-discovery grows in a society that frequently imposes rigid societal expectations and norms. Amidst the era of constant visual stimulation from social media, commercials, and digital displays, photography remains a powerful means of self-expression. Fine art photography goes beyond simply documenting moments; it serves as a medium for artists to express their feelings, thoughts, and distinctive viewpoints on the world. According to Thomas & Mackenzie (2020), "fine art photography doesn't have a definition of its own. But it does attract those who share a specific vision. Fine art photographs are created as carefully as paintings. They're often difficult to create in one session. They stand out because of their details, compositions, and meanings". This investigation explores the domain of fine art photography as a means of self-expression. Self-expression is a notion that is very commonly and very positively

used in contemporary popular culture in the U.S. Self-expression is a notion that is closely associated with a horde of positive concepts, such as freedom, creativity, style, courage, self-assurance, and even healing and spirituality (Kim & Ko, 2011).

This introduction seeks to provide answers to the key questions posed in the abstract, shedding light on the significance of fine art photography as a medium for self-expression, the development of personal identity, and self-discovery. This research acknowledges first and foremost the limitations of conventional forms of self-expression in capturing and articulating the complex depths of the human experience. Language, whether verbal or written, frequently falls short in conveying the complexities of emotion and personal narrative. Fine art photography emerges as a dynamic alternative that empowers individuals to visually express themselves, utilising the transformative power of imagery to communicate on a profound level.

Personal identity exploration and self-discovery are crucial in modern society. The pressure to conform to societal norms can obscure one's true self, resulting in a disconnection between one's internal experiences and external presentation. Fine art photography affords individuals a one-of-a-kind opportunity to delve into the depths of their being, investigate their personal identities, and express their genuine selves through visual storytelling. Various techniques and approaches exist within the realm of fine art photography to facilitate self-expression. Composition, lighting, subject matter, and post-processing techniques play crucial roles in the creation of evocative and introspective photographs. Moreover, artistic styles such as conceptual photography, surrealism, and documentary photography provide unique avenues for communicating personal narratives and emotions. To comprehend the effect of fine art photography on self-expression and self-discovery, it is necessary to consult existing literature, empirical research, theoretical frameworks, and specific case studies. These sources contribute to a greater understanding of how engaging with fine art photography can evoke profound emotions, capture personal narratives, and allow individuals to explore and define their identities.

This introduction concludes by laying the groundwork for exploring the significance of fine art photography as a medium for self-expression, the development of personal identity, and self-discovery. By examining the distinctive characteristics of fine art photography and its potential impact on the lives of individuals, this investigation seeks to shed light on the transformative possibilities offered by this medium. Photography has long been used to record our surroundings. Photographers have always tried to tell stories, evoke emotions, and explore human experience. Photography has evolved with art. Fine art photography offers a fresh take on visual storytelling and self-expression. This study explores fine art photography and self-expression. Fine art photography is less structured than traditional photography. Fine art serves as a medium through which individuals can express themselves. It's technical components, fine art photography, is a very intimate pursuit that enables individuals to convey their most profound emotions, experiences, and stories through visual representation. It offers a medium to express the intricacies of the human experience, surpassing linguistic obstacles and resonating with the viewer's innermost being.

Unlike factual or commercial photography, which frequently serves particular objectives or interests, fine art photography is unrestricted by such limitations. The artwork incorporates ambiguity, symbolism, and abstraction, encouraging viewers to interpret and emotionally engage with the imagery. Every snapshot serves as a mirror of the artist's mind, capturing brief instances filled with intricate significance and intense emotion. It forces photographers to try new methods, materials, and ideas. In today's image-driven society, self-expression is crucial. We try to express ourselves honestly. Fine art photography allows artists to express themselves beyond traditional techniques and narratives. This study examines fine art photography and self-expression to illuminate individual creativity. Fine arts, psychology, and visual communication can help us understand fine art photography as a form of self-expression. Furthermore, fine art photography provides a refuge for deep contemplation and personal exploration. By engaging in the creation and curation of images, artists undertake a voyage of self-discovery, addressing their anxieties, wants, and vulnerabilities. The

camera serves as an extension of one's self, capturing not just the external environment but also the inside realm of ideas and emotions.

Moreover, fine art photography functions as a catalyst for social and cultural critique. Artists employ their perspectives to illuminate urgent matters, question established conventions, and stimulate intellectually stimulating discussions. Through the utilisation of visual storytelling, they enhance the influence of voices that are frequently marginalised or disregarded, promoting empathy and comprehension among many cultures. During this journey, we will traverse the intricate landscape of fine art photography, deciphering its intricacies and revealing its capacity as a means of self-expression. By examining the works of different artists, we will explore how photography surpasses the limitations of time and location, making a lasting impact on the shared awareness of humanity. This research examines fine art photography's expressive potential using theoretical analysis, qualitative research, and visual analysis. We aim to enrich arts and psychology knowledge by studying fine art photography's history, artists and photographers' perspectives, and aesthetic and narrative elements. Finally, this research expands our understanding of fine art photography as a tool for personal expression by revealing its potential to empower individuals, foster personal development, and deepen our collective understanding of the complex relationship between art, self-expression, and the modern human experience.

LITERATURE REVIEW

The article reviews Fine-Art Photography by Thomas and Mackenzie (2020) discusses art photography. Fine art photography expresses the vision of the artist. Fine art photography conveys a concept, message, or emotion. This is distinct from representational photography, such as photojournalism, which depicts objective reality rather than the subjective intent of the photographer, and commercial photography, which advertises products. Regardless of the topic, it will affect you. It should not motivate you to conquer the globe. The concept of beauty is subjective. No one can define fine art. Photography revolutionized art in the same way that the printing press revolutionized literature. In this study, however, information about fine art photography captures the artist's vision, ideas, and emotions, distinguishing it from photojournalism and commercial photography, which are not comparable. It has a subjective beauty that has varying effects on viewers, regardless of the subject matter. As the printing press revolutionized literature, photography transformed the art world.

Christian (2007) examines Nikki S. Lee's 1997–2001 project photographs and their relationship to culture and identity. Lee imitates different cultures in this series. Lee challenges the subject-object relationship in snapshots, casting doubt on their authenticity. The Projects series encourages viewers to create their own narratives to reconcile the uncertain connections between Lee, her hosts, and the audience, especially regarding cultural representation. These ambiguities raise questions about the complex and problematic visual portrayal of identity and how it reinforces and challenges dominant visual cultural norms. Therefore, the information in this study can be used to generate better ideas for questioning identity.

Pivac & Zemunik (2020) in *The Self-Portrait as a Means of Self-Investigation, Self-Projection, and Identification among the Primary School Population in Croatia*, to help find a new corpus of knowledge in understanding the artist's personality. The self-portrait is both a visual, physical representation of the artist's personality and a psychological medium for self-exploration and communication. The self-portrait allows for self-reflection, self-awareness, and self-acceptance. It has subjective, objective, and archetypal values. Since the self-portrait is not only a means of introspection for artists but also for the entire population, from early childhood to old age, its projective and reflexive features were used for diagnostic and therapeutic purposes. However, the therapeutic concept in this study will not be analyzed in depth due to the limitation of the study to only identity and self-portraits.

Qian (2021) examines art photography, social media, and digital culture. It emphasizes that art photography has become digital and now exists on social media platforms. Art galleries and photographers use social media to promote and exhibit their work, which increases popularity and audience aesthetics. Some photographers use social media as a studio to discuss popular photography, gender, and themselves. Social media and digital culture could have a big impact on art photography. The article suggests art photographers and institutions use social media to increase their influence and offer new aesthetic experiences. Art photography can also explore social media's identity, privacy, and selfie culture issues. The article shows how technology shapes art and how artists can address societal issues and change. To better understand art and social media, future research should include more artists, photographers, institutions, and art forms. The article suggests looking at graffiti and street art, which are also shared on social media. This expanded analysis seeks to explain the relationship between art and social media and show that photography should be viewed in a broader context. Therefore, this study will try to maintain the way the exhibition is carried out more effectively, not only for visitors but also for the artist himself.

In an interview with Lucas Blalock in 2020 regarding experimental photography, he said that in an era of unprecedented compatibility and transparency between viewers and artists, these artists are at the forefront of a dynamic facet of contemporary art photography that intentionally speaks to the universality of digital image capturing and sharing in daily life (Cotton, 2021), . Their work encourages us into the experimental terrain of this completely new media environment, where the origination, behavior, and reading of photographs have been culturally upended.

Winton (2016) in *Using Photography as a Creative, Collaborative Research Tool* examined research concerns related to creative, collaborative photography. The research detailed here had modest results but allowed reflection on the more significant epistemological and methodological circumstances surrounding participatory, youth, and visual techniques. This project's approach was relevant and meaningful to participants. It was proper, not age-appropriate. In a more personal sense, photography is a fulfilling research tool, especially for my research. In the meantime, this research helps me share with people through the creative process, which may be an organically meaningful element of the research encounter. I support situating knowledge in youth research for several reasons. However, creative, reflective, and multifaceted selves are later revealed: a partnership between visual researchers and social art therapy practitioners would help creative photography in research reach its full potential. This experimental, collaborative research project motivated me to employ innovative techniques to improve research practice.

Ferreira (2012) in *Imperfect Depictions – Experimental Practices in Photography* said a photograph's success or failure depends more on aesthetic preference and viewer expectations than on its light portrayal. Most photographers follow visual standards or aesthetic trends. Others are resisting. They (re)discovered and (re)invented new media possibilities and interpretations by following their visions. These people think the image may give a poetic, metaphorical, or critical reaction to the world beyond the camera's instrumental or formal view. More photographers Educational function and communication advantages of thematic photography in the 5G era based on educational psychology intentionally making technical blunders to generate flawed images. Their presence may be a reaction to digital photography's standardization. These photographers reject the prevalent realistic, dull, severe, and impartial photos of the previous 30 years. Julia Margaret Cameron's retort to the 19th-century photographic establishment may justify experimental photography today: Who can reject or disapprove of an artistic choice, and how is failure indicated? Artists learn from failure. Failure is brave because it defies convention and explores new creative grounds. Artistic failure can spur medium-term improvement and discoveries. Contemporary photography includes diaristic, abstract, and personal aesthetic explorations, nostalgic emulsion experiments, and analog photochemical processes.

Article *The Choices Hidden In Photography* explained photography, like painting, preserves light measurements precisely. This article uses film and smartphone photos to demonstrate that photography involves color, tone, and perspective decisions like painting. Thus, understanding picture

perception involves recognizing photography as one technique to produce pictures. These decisions affect graphical perception, which might lead to novel imaging approaches (Hertzmann, 2022). More study is needed. Furthermore, this research will define a new photography concept based on the photographer's identity.

Based on Fox and Caruana (2012) the ideas do not exist in a void – nothing is absolutely new. You bring your own unique vision to any body of work and that vision has been informed and influenced by everything you have researched along the way. Embarking on research can feel daunting and overwhelming. Take a step back and draw up a plan or map to help you navigate the options you have ahead of you. As a result, the concepts presented in order to build an artist's identity will be the primary emphasis of this research. The process of getting to know oneself through the skills of photography is highly subjective, but it is still possible if adequate study and references are used.

Guan (2021) in Educational Function And Communication Advantages of Thematic Photography In The 5G Era Based On Educational Psychology Educational explained psychology studies learning, intervention, teaching, and school-organized social psychology. Educational psychology applies psychology to education. Educational psychology can develop courses, enhance teaching techniques, encourage students, and help them deal with growing up. Educational psychologists do theoretical work and research, while school psychologists work in schools or related settings. Educational psychology studies student development. Special education pupils are prioritised in practical work.

METHODOLOGY

The process that begins with assessing and interpreting creative works, literary and art criticism enriches cultural dialogue. Both disciplines analyse the aesthetic and intellectual value of literary and artistic works. They have distinct but overlapping objectives. Literary criticism analyses novels, poems, plays, and essays. Examining plot, character, language, symbolism, and themes. Critics investigate how these components generate meaning and evoke emotion. They may also investigate the historical, social, and cultural conditions that influenced the creation and reception of the work. In contrast, art criticism evaluates paintings, sculptures, photographs, and other forms of visual art. Composition, colour, texture, and technique are evaluated by critics.

They investigate the artist's intent, message, and audience response. Art criticism also investigates the artwork's historical and cultural contexts, as well as its relationship to larger creative movements. In both disciplines, critics impact public opinion and artistic production. Their evaluations can enhance the aesthetic experience of the audience by disclosing a work's complexities. Artists and writers can enhance their skills and vision by receiving constructive feedback. Literary and art criticism analyse subjectivity using concepts and methods. Critics analyse utilising formalism, structuralism, postmodernism, and feminism. Culture and the arts are enhanced by literary and art criticism. They inspire critical conversations, deepen our understanding of creative works, and promote artistic expression. Through critique, literature and art can query, enlighten, and captivate us.

RESULTS

German-born fashion photographer Erwin Blumenfeld (1897-1969) innovated and influenced. His experimental approaches, surrealist compositions, and pioneering colour use made him famous. Blumenfeld was born on January 26, 1897, in Berlin. He became interested in art and photography as a child in a middle-class Jewish family. He lost one eye in the German army during World War I.

Blumenfeld became an Amsterdam commercial photographer in the 1920s. He took portraits and stunning fashion photos for advertising agencies. The Nazis were increasingly persecuting Blumenfeld and his family. Blumenfeld, his wife, and three children fled Nazi persecution to Paris in 1936. He photographed for *Vogue* and *Harper's Bazaar* in Paris. As shown in Figure 1, Blumenfeld demonstrated his talent with a series of images such as this one of the model Lisa Fonssagrives striking a vertiginous pose on the structures of the Eiffel Tower. It was published in the May 1939 issue of *Paris Vogue*.



Figure 1. In Vogue: Lisa Fonssagrives on the Eiffel Tower, Paris, 1939
(Source: *Delpire, 2023*)

Blumenfeld's avant-garde techniques, odd stances, and darkroom modifications defined his style during this time. Blumenfeld fled again during WWII. His family fled to New York City in 1941. He worked with major fashion periodicals and captured post-war elegance there. Blumenfeld's US work was lauded, making him a notable photographer. He explored colour photography with elaborate arrangements. His unorthodox perspectives and cropping questioned beauty standards. Blumenfeld worked with famous models like Grace Kelly, Audrey Hepburn, and Marlene Dietrich. His pioneering fashion photography style shaped the business. Erwin Blumenfeld worked prolifically for decades until his death in Rome, Italy, on July 4, 1969. His aesthetic vision, technical skill, and fashion photography contributions live on. His work still inspires and captivates.

In September 2021, there was no well-known self-expressionist artist called Chyntia Morris Sherman. She may be an up-and-coming artist whose work became popular after my knowledge cutoff date. I don't know enough about Chyntia Morris Sherman to critique her art or self-expressionism. If she has become an artist after my previous update, I suggest searching current art databases and sources for information on her work, style, and self-expressionism effect. Self-expressionism is a movement that values uniqueness and self-expression. This movement's artists typically express themselves via their works.



Figure 2. Untitled #126 (1983)
(Source: Delpire, 2023)

Based on Figure 2, self-expressionism values subjectivity and encourages artists to express themselves. Critics of self-expressionism sometimes challenge the line between art and self-expression.

They claim self-expression should not dominate technical proficiency, idea development, or greater social issues. Some critics also believe that concentrating on personal expression might lead to self-indulgent work that doesn't appeal to a wider audience. Self-expressionists see it as freeing and honest art. They think art based on real feelings and experiences can be powerful and move people. Self-expressionism allows artists to express themselves without limits. As with every art trend, self-expressionism is debated and interpreted by the art world.

Sophie Calle, a modern artist, uses unusual self-expression. Her works frequently blend art and life, highlighting important themes about privacy, identity, and voyeurism. "The Hotel," one of her most famous works, shows her unique flair. In "The Hotel," Calle secretly photographed guests' things and wrote about her experiences as a Venetian hotel chambermaid.

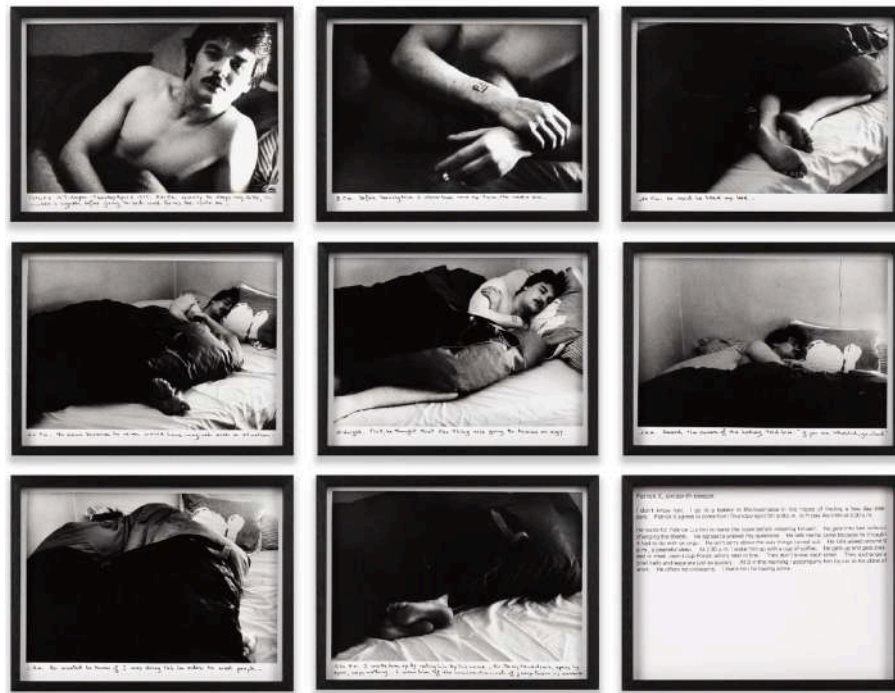


Figure 3. Patrick X, Sixteenth Sleeper, 1979
8 gelatin silver prints & 1 text panel, 19 x 24-3/4 inches (overall, approximately) [48.3 x 62.9 cm], edition of 3 English & 3 French
(Source: Delpire, 2023)

This work as shown in Figure 3 has been criticised for violating strangers' privacy and exploiting vulnerable people. Contemporary art debates the ethics of voyeuristic art. Calle also mixes self-expression with self-indulgence by incorporating her personal life into her work. In "Exquisite Pain," she shared her anguish following a breakup. While brave, this degree of sensitivity raises issues about the artist's aim and public exhibition. Calle's insightful narrative engages listeners despite the criticism. Her work explores the human mind by challenging viewers' limits and social standards. Sophie Calle's self-expression is intriguing and controversial. Her immersive and challenging work raises questions about privacy, ethics, and the artist's creative process. Calle's work continues to spark art industry debate about self-expression and its effects on artists and audiences.

DISCUSSION

Self-expression is the act of communicating to others or to oneself one's thoughts, emotions, ideas, or identity. It is the process of sharing and communicating one's personal experiences, beliefs, values, and uniqueness in a manner that reflects one's genuine self. Self-expression can take many forms, including art, music, writing, fashion, body language, speech, and other expressive or communicative channels. Self-expression is a fundamental aspect of human nature that is essential for personal development, emotional health, and forming relationships with others. It permits people to articulate their individuality, assert their identity, and assert their autonomy. People can communicate their perspectives, desires, and emotions through self-expression, promoting understanding, empathy, and connection with others whose expressions resonate with them.

Fine art photography is a subgenre of photography that aims to create visually arresting and artistically expressive images. It is a form of artistic expression that enables photographers to communicate their emotions, thoughts, and ideas through visual narrative. Fine art photography,

unlike commercial or documentary photography, is driven by the artist's personal vision and creative interpretation. Fine art photography is distinguished in part by its emphasis on aesthetics and artistic composition. Photographers carefully consider elements such as lighting, framing, perspective, and colour to create visually engaging photographs. Rather than merely presenting a realistic depiction of the subject, the objective is to elicit emotions and stimulate thought in the viewer.

Fine art photography is also characterised by its exploration of subjective and conceptual themes. Artists frequently use abstract concepts, symbolism, and metaphorical representations to communicate deeper meanings and invite viewers to interpret the images themselves. Fine art photographers use their creative vision to transform ordinary subjects into extraordinary visual narratives that challenge conventional perspectives and elicit reflection. Creating photographs of fine art requires both technical skill and artistic vision. To achieve the desired effect, photographers may experiment with various techniques, such as long exposure, multiple exposures, or unconventional camera angles. In addition, they may use various post-processing techniques to enhance or alter the image, thereby adding a distinct artistic touch.

In addition to its artistic qualities, fine art photography has gained legitimacy as a visual art form. Fine art photographs are displayed in galleries, museums, and art fairs, where art enthusiasts and collectors admire and collect them. In addition to technical skill, the value of a fine art photograph is determined by the artist's unique vision, creativity, and ability to convey a compelling message. Fine art photography is a medium that combines technical proficiency, artistic vision, and individual expression. It permits photographers to transcend the limitations of documentation and enter the realm of creativity and emotion. Fine art photography enables artists to communicate their innermost thoughts, ideas, and experiences through careful composition, conceptual investigation, and visual aesthetics, inviting viewers to engage with the images on a profound level.

Personal identity, in the context of the exploration of fine art photography as a means of self-expression, refers to an individual's distinct sense of self and comprehension of who they are. Fine art photography provides photographers with a visual platform to explore and express their individuality. Photographers can capture and communicate aspects of their own identities and broader human experiences through the creation of images. This visual medium enables a direct emotional connection, allowing viewers to intuitively engage with the photographer's personal identity. Fine art photography serves as a catalyst for introspection, self-reflection, and personal development, enabling individuals to embrace and assert their unique identities.

In the context of the main topic of exploration of fine art photography as a medium for self-expression, self-discovery refers to the process of gaining deeper insights into oneself, revealing hidden aspects of personal identity, and fostering personal growth and development. Fine art photography can serve as a catalyst for self-discovery by allowing individuals to visually express their thoughts, feelings, and experiences. By creating and interacting with fine art photographs, individuals can explore their inner world, confront their personal beliefs and values, and gain a deeper understanding of their unique identity. This process of self-discovery through fine art photography can result in increased self-awareness, purpose clarity, and a heightened sense of authenticity and fulfillment.

CONCLUSION

In conclusion, the study on fine art photography and its influence on self-expression provides compelling evidence that photography is an effective instrument for self-discovery and personal development. Individuals can visually express their thoughts, emotions, and experiences through fine art photography, leading to a greater understanding of themselves. By investigating various elements

such as composition, illumination, subject matter, and post-processing, individuals can create emotive and memorable photographs.

In addition, the study highlights the ethical considerations involved in self-expression through fine art photography. To ensure that photography remains a respectful and responsible form of self-expression, it is vital to address issues such as privacy, permission, and the creative use of human experiences. Overall, the research highlights the positive impact of fine art photography on self-expression and encourages its use as a tool for self-exploration. Photography has the potential to encourage conversations, gather emotions, and shape identities through visuals. By embracing fine art photography, individuals can not only enhance their self-discovery but also foster advancement and personal growth. As such, photography is a valuable and enriching medium for individuals pursuing artistic and introspective expression.

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Minimalistic Compositional Techniques: 'Glass' By Hania Rani

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ABSTRACT

The purpose of this paper is to investigate the minimalist techniques used in minimalist compositions and to identify the minimalist technique characteristics that cause listeners to perceive the music as minimalist music. This paper also provides information to other composers who require time to learn and familiarise themselves with minimalist techniques. This research seeks to identify the various minimalistic approaches and investigate the melodic progression of "Glass" by Hania Rani, a Polish composer and pianist, and how it has been creatively employed in her composition. The findings from this research will tremendously assist composers and pianists in getting a deeper knowledge of theory and minimalist concepts or procedures. Moreover, the piece 'glass' by Hani Rani is not widely known, and this investigation indirectly introduced the reader to contemporary minimalist composition.

Keywords: *Minimalism, Minimalistic Techniques, Music Composition, Piano*

INTRODUCTION

In relation to music, what does minimalism mean? Why have so many authors applied a phrase from the language of art historians to music? In music, minimalism has been defined as an aesthetic, a style, and a technique, each of which has supplied an adequate explanation of the term at different stages of its development. In addition, several of the most well-known minimalist composers in the world, including Philip Glass and Steve Reich. Some younger composers, including Hania Rani, frequently compare themselves to Philip Glass. Through this exploration of the term, we intend to illustrate that minimalism can be successfully defined as a strategy by describing the various types of minimalism.

There are numerous reasons why minimalist compositions appeal to listeners. There is no rite of passage typical of many avant-garde forms that requires listeners to be familiar with the composer's musical beliefs and perspectives to enjoy it. The fact that minimalism is so repetitive should not be

viewed as a weakness, but as one of its most distinguishing and alluring characteristics. The research objectives underlying this study are:

1. To investigate the melodic development in 'Glass' by Hania Rani
2. To investigate the minimalistic techniques used in 'Glass' by Hania Rani

LITERATURE REVIEW

Life of Hania Rani

Hania Rani is a pianist, composer, and musician with residences and places of employment in both Warsaw and Berlin. She has composed for strings, piano, vocal, and electronics, and has collaborated with artists including Christian Löffler, Dobrawa Czocher, and HiorChronik. She has performed at some of the most famous venues and festivals in Europe, including the National Philharmonic in Warsaw, the Funkhaus in Berlin, and The Roundhouse in London, as well as Open'er, Scope Festival, and Eurosonic. Her solo piano works were inspired by a fascination with the piano as an instrument and a desire to explore all of its sonic and harmonic possibilities in a manner that was uniquely her own.

Rani grew up in Gdansk, surrounded by music and films, with her parents (a doctor and an architect) (a doctor and an architect). Initially attracted to classical music, she was introduced to jazz and electronics at music school, extending her horizons and, in her words, "mixing Chopin and Schostakovich with Dave Brubeck and Moderat." Among the composers that have affected her are Max Richter, Esbjorn Svensson, Miles Davis, Nils Frahm, Murcof, Portico Quartet, Radiohead, and even The Beatles. Not only does Rani draw inspiration from music, but also from the locations she has lived and visited. The visual arts can also inspire creativity. Her father was an architect, and she has always been interested in the arts. In fact, for Rani, an image or colour often comes first; she calls this a "sound image." (Records, 2020)

'Glass tone' technique

Since almost a century ago, physicists and musicians have discussed whether the sound of an isolated piano tone is purely influenced by the final hammer velocity, or if a pianist may alter the piano's timbre by altering the way the keys are struck, regardless of hammer velocity (Bryan, 1913). Pianists study for decades (KA Lehman, 1996) to develop a sophisticated technique for touching the keys so that the resulting sound fulfils their high aesthetic standards (Gerig, 1974). In order to gain subtle timbre subtleties and convey their interpretation of the music to the listener, they construct and practise a large inventory of diverse key press actions (Neuhaus, 1973).

Different techniques of contacting the keys were researched about a century ago (Ortmann, 1925). The kinematic properties of keys played with different touch types were investigated. Using a piece of smoked glass attached to the side of a piano key against which a vibrating tuning fork leaves sinusoidal imprints, he observed the precise acceleration patterns of the key presses (differences in key velocity being mirrored in variations in the wavelength of the recorded fork signals). (Otto, 1929) A "percussive" and a "non-percussive" touch were identified. The former is characterised by a finger impacting the surface of the key with a specified velocity, causing the key to accelerate very rapidly. With the last touch, the finger rests on the key's surface and pushes the key in a rhythm that gradually accelerates. Similar antagonisms have been studied since then. "hard" against "soft" touch (Friberg, 1964) and "struck" versus "pressed" touch (Suzuki, 2007).

In "Glass," Hania Rani attempts to replicate the sound of glasses clinking together. According to one of her interviews she mentioned that "The shimmering "Glass" captures/reflects the playfulness and multitude of colours and timbres like a piece of glass glowing in the light." (Rani, Interia Muzyka, 2019). Instead of listening to pre-recorded audio, Rani stated that she leaves the 'clattering' sound of the piano

hammers in order to recreate the live mood. It was a purposeful decision taken by both Rani and her sound engineer. Since they are aware that these technical noises have no place in classical music and that sound engineers frequently do audio cleanup in post-production, she chose to incorporate them into her work. Hania Rani opted for a different technique, transforming the tiny sounds into music and, on occasion, character, or ambiance. With the goal of the listener listening to it through the instrument. In this instance, she believes that the existence of these microscopic sounds will make the record engaging in some manner (Rani, 2019).

Minimalist techniques

Minimal music emphasises the elements that were eliminated from serialist style, such as repetition, regular pulse, diatonic and tonal structures. In addition to the previously listed techniques, phase shifting is a common minimalist composing method (Beirens, 2003). Steve Reich developed slow phase shifting in *It's Gonna Rain* (1965) and studied it in other works prior to *Drumming* (1971). In contrast, Rani's *Glass* has utilised the phase shifting method in her work. Jazz performers, particularly John Coltrane, certainly impacted composers like Terry Riley, Steve Reich, and Philip Glass to write in a distinctly modal style (Beirens, 2003). In general, Rani's minimal music does not utilise the modal scales that are characteristic of the music of American composers such as Riley and Glass. Although Rani mentioned that Philip Glass and a few other jazz musicians are her primary influences, she did employ a diatonic approach in her pieces.

Minimal music, on the other hand, possesses a level of aesthetic redundancy unmatched by even the finest pieces. There are several long sustained tones, recurring rhythmic, melodic, and/or harmonic patterns, cells, and phrases (Heisinger, 1989). In addition, Glass employs incremental harmonic shifts that juxtapose tonally useful chords with embellishing chords to emphasise the dramatic nature of his work (Sanchez-Behar, 2021).

METHODOLOGY

In order to acquire deeper information on this subject, observations were made, for instance examining the music score and monitoring the audio-visuals. First, information about minimalistic compositional techniques: 'glass' by Hania Rani was gathered from a variety of current sources, including journals, essays, and e-books. Next, musical scores were evaluated to further comprehend Hania Rani's *Glass*'s use of minimalist creative approaches. The score analysis was done simply on the introductory extract and the targeted part. In addition, an analysis of the minimalistic method component of the audio-visuals of "Glass" has been made. This analysis was conducted on the videos acquired from YouTube channels.

Findings and Discussion

The aim of this study is to investigate the melodic development in "Glass" and to examine Hania Rani's applications of minimalistic techniques in her composition "Glass". This piece is a new composition that gives a minimalist atmosphere when listening to it. Findings are presented based on the results and data analysis. It is to be informed that the focus of this research is to point out what are the types of minimalistic techniques that are used and how it is innovatively applied in this music. Apart from that, it could also be considered through other aspects of music such as the harmonies, chord progression, and the melodic development. Harmonic, melodic, and structural analysis has been performed on the scores, which have been divided into seven sections labelled A through G to ease comprehension.

In terms of general analysis, it can be determined that the work is in the mode of C# minor. This piece has a pace of 108 beats per minute, and the rhythmic patterns are continually shifting with some repetition throughout the entire portion. Furthermore, there are no specific accented notes, slurs, or other

dynamic markings in this score, indicating that it is relatively basic in terms of dynamic markings. Hania Rani intended for the players to interpret her piece "Glass" in their own way.

To undertake a comprehensive melodic analysis, the melody is broken down into crotchets and minims. This is accomplished by simply taking the notes on beats 1 through 4 for the crotchet reduction and beats 1 and 3 for the minim reduction, which are the strong/accented beats in 4/4 metre time (Figure 1 and 2). Through the crotchet reductions, the conceivable variation patterns are evaluated, and the contour of the melody is analysed through the intervals of the minim reductions.



Figure 1. Example of crotchet reduction of the melody
(Source: Author's collection)

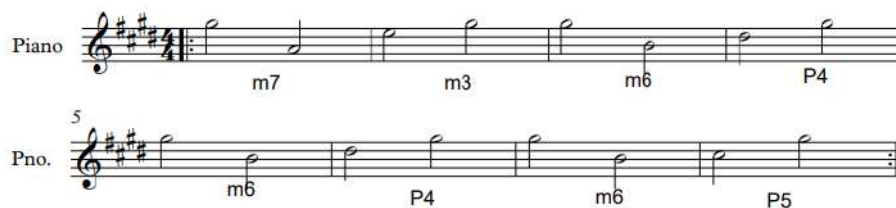


Figure 2. Example of crotchet reduction of the melody
(Source: Author's collection)

From the A Section (Bar 1 to 8), the phrasing of the melody from the intro is symmetrical in terms of the number of bars. These phrases create a symmetrical phrasing as they all share the same number of bars which is 2, thus having the intro sound more balanced. In terms of piano left-hand techniques, there is the usage of ostinatos which changes every 2 bars. It is a characteristic of minimalist style that rhythmic or melodic motifs seldom recur over a section or work. In the B section (Bar 9 to 28), the chord progression is in diatonic chord, and the left hand played arpeggios throughout the section. For the melody, there are three specific patterns which were repeated throughout the section. The pattern in Bar 10 is repeated in bar 16, pattern in bar 17 is repeated 4 times (Bar, 19, 21, 23 and 27) and the pattern in bar 20 is repeated in bar 24 and 28. The primary modification or addition to section C (Bars 29 to 46) would be the inclusion of Borrowed chords. These borrowed chords appear in bar 31, 35, 39, 41 and 43. There is also an augmentation melodic development which occurs in bar 46. The majority of section D is a duplication of sections A, B, and C. Similar to the repeat of melodic motives in section B, this is a larger repetition that occurs throughout the whole section.

The completion of the score analysis effectively conveyed Research Objectives 1 and 2 and determined the solutions to both Research Questions. Hania Rani makes heavy use of minimalistic ideas in her piece "Glass." We may also observe how the piece's melodic developments indicate its use. The

examination of these two Research Objectives demonstrates that this composition has a positive effect on both the performer and the listener.

In terms of chord progression, Hania Rani included borrowed chords into her composition to differentiate it from diatonic chords and impart a new atmosphere. Borrowed chords are frequently used as "colour chords" to provide harmonic diversity by employing contrasting scale types, such as major and minor scales. In addition to the major and minor modes, chords can also be derived from other parallel modes, such as D Dorian and D major (Bouchard, 2007). Table 1 displays the bars in which Hania Rani utilised borrowed chords in her composition:

Table 1. Borrowed Chords Utilised In 'Glass' by Hania Rani

Chord Type	Bars
Borrowed Chords	31
	35
	39
	41
	43
	49
	77
	80
	85
	89
	93
	94
	97
	98
	101 - 104
Diatonic chords	Remaining Bars

Arpeggios, often known as broken chords, are widely used in minimalist music. Well-known composer Philip Glass is noted for his use of ostinato, arpeggio, and repeated rhythms, as well as his jazz inspirations (Ho & Rodriguez, 2019) This is all included in Rani's piece "Glass." The left-hand ostinato is continually shifting every two bars according to the chord sequence employed in the composition. The table below displays the frequency of left-hand arpeggio use.

Table 2. Frequency of Arpeggios in 'Glass' By Hania Rani

Arpeggios On The Left Hand
Bar 1- 2
Bar 8 – 9
Bar 5 -6
The Whole Page 2
Bar 19 – 24
Bar 27 – 28
Bar 47 – 48
Bar 51 – 59
The Whole Page 7
Bar 70
Bar 73 – 74
Bar 105 – 106
Bar 109
The Whole Page 12

After analysing the melodic advancements, we can determine that Hania Rani has 42 distinct melodic variants, bringing us back to Research Objective 1. Table 3 illustrates the repeated modifications to the melody throughout the piece. According to the obtained data, variety 12 is the most widespread variant.. Because it is simpler to analyse the melody in terms of variations, the melody has been organised into four crochets in a single bar.

Table 3. Repeated Melodic Variants in 'Glass' By Hania Rani

Variant	No. of Times repeated	Variant	No. of Time Repeated
1	13	13	3
2	4	14	6
3	5	15	4
4	7	16	8
5	6	17	5
6	4	18	2
7	3	19	4
8	2	20	6
9	2	21	2
10	2	22	2
11	3	23	2
12	10	26	2

From the same grouping of melodies, we can also see that the beginning notes of each melody are those listed in Table 4. The most prevalent note is G, whereas A and A# are used the least. The G note is also the most often utilised note in Rani's composition. Drone is one of the most notable characteristics of minimalist music. A drone is a lengthy, continuous note or a sound that is continuously repeated.

Table 4. Starting pitch (notes) in 'Glass' By Hania Rani

Pitch (note)	No. of Times
A	1
C	12
D	10
E	29
F	5
G	62
A#	1

In table 5, the melody is presented as two minims per bar. The notes that have been transcribed represent the melody's emphasis (beat 1 and 3). The stress pattern in common time is "strong, weak, strong, weak." It doesn't matter what the actual rhythm is, the underlying stress pattern is indicated on top. Any rhythms performed in this metre will have this stress pattern. Table 5 reveals that the most prevalent interval is the Perfect 8th, while the least utilised interval is the Major 6th and Hania Rani did not use the Major 7th interval in her work "Glass."

Table 5. Intervals in minim reduction of the melody in 'Glass' By Hania Rani

Interval	No. of Times
Minor 2 nd	2
Major 2 nd	11
Minor 3 rd	2
Major 3 rd	16

Perfect 4 th	9
Perfect 5 th	6
Minor 6 th	12
Major 6 th	1
Minor 7 th	13
Perfect 8 th	44
Unison	2

A composition in 4/4 metre can be interpreted in a variety of ways. If the work is played at a very slow pace and includes several subdivisions of each quarter note value, the metrical organisation can be interpreted as having four fundamental pulse-beat units. This might provide a metric interpretation of a measured pulse-beat mode with one half-note primary pulse-beat unit and one half-note secondary pulse-beat unit, while the piece is being performed at a rapid speed. Regardless of whether pulse-beat grouping is selected, that grouping often recurs frequently throughout a performance (Ulrike Halsband, 1994). Figure 3 below depicts the melody's underlying motif; to hear the melody's prominent notes (those with a higher-sounding pitch), one must hear the motif's underlying motif.



Figure 3. Glass Melody
 (Source: Author's collection)

The performance interpretation analysis was gathered from a YouTube video of Hania Rani performing her piece "Glass" at Studio S2, Poland, which was shot on YouTube. It is evident from her performance that the sound engineer utilised the A-B miking technique and a variety of microphones to obtain the 'glass tone.' Using the spaced-pair (or A-B) approach, two microphones are positioned several feet apart and pointed directly at the musical ensemble (Figure 3). The microphones may have any polar pattern, although the omnidirectional pattern is the most common for this technique. The larger the mic separation, the wider the stereo dispersion. (Barlett, 2006).

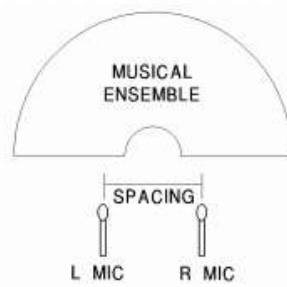


Figure 4. Example of A-B miking technique



Figure 5. Hania Rani performing her piece “Glass”, filmed in Studio S2, Poland
(Source: https://www.youtube.com/watch?v=l0yRNQj2_tc)

CONCLUSION & RECOMMENDATIONS

In conclusion, modern composers use a variety of creative strategies, particularly minimalism compositional. Hania Rani is a Polish pianist who draws inspiration from both jazz and classical music. Much of her works feature minimalism and jazz or more improvisational characteristics. Utilising touch, pedalling, overtones, and the balancing of simultaneous layers of dynamics, pianists produce hues. Changes in any of these areas will alter the piano's sound, and there are variations within each of these categories. However, sound engineers have a significant part in executing the piano's sound by employing various miking techniques. Moreover, the melodic developments and usage of minimalistic approaches in this work greatly aid composers and pianists in gaining a deeper understanding of theory and minimalist concepts or procedures. In addition, this work is not well recognized, and this research indirectly introduced the reader to current minimalist composition. This study's findings will assist not only students, but also society as a whole, particularly composers who are interested in sound engineering and experimenting with sound in general, and will add to our understanding of the methodologies of various miking approaches.

The researcher advises composers to include minimalist methods into their work. To produce a composition that is basic yet successful, they must delve further into minimalist themes and listen to more minimalist music. The popularity of minimalism can be traced in part to its harmonic accessibility and dynamic rhythms. Its works make use of the psychology of rhythm and highlight the mathematics of augmentation, diminution, and subdivision, as well as the cadence's varying textures and dynamics. The simplest musical methods may be the most interesting in terms of producing a bewitchingly powerful attraction, and minimalism has utilised absolute simplicity to highlight the subtlest transitions while maintaining complexity.

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