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Original Research

Revolutionizing Museum Sustainability: Harnessing 4I Theory for Innovative Cultural and Creative Product Design

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Abstract

Novel design of cultural and creative products for the museum will not only help the museum follow the trend of times to meet the people's growing spiritual and cultural needs but also promote traditional culture to raise the growth of influence and economy, which is conducive to the sustainable development of the museum business. In the design of Museum Creativity and Cultural Products (MCCP), it is necessary to change the traditional development concepts, actively study advanced development concepts and business models, conform to the trends of the times, and design multi-element products to realize promotion. This research aims to find an efficient way for cultural and creative products to guarantee the stable operation and development of museums to enhance the presentation of compressed national strength. This research utilises the 4I(Interesting, Interests, Interaction, Individuality) theory to perform the design of cultural and creative products to promote the quality of products. Research shows that MCCP design optimized based on the 4I theory can effectively enhance the attractiveness and market performance of products. MCCP design needs to gradually break with traditional thinking and explore new paths such as brand alliance and high-tech integration to further ensure the market competitiveness of its MCCP and achieve sustainable development.

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1 Introduction

1.1 Background to the Study

The cultural and creative industry (CCI) plays a crucial role in modern national economic development by driving growth, employment, and international trade. It encompasses arts, design, fashion, media, and software development, combining creativity with monetary value (Rodríguez-Insuasti et al., 2022). Museum Cultural and Creative Products (MCCPs) refer to consumer goods inspired by museum collections, offering cultural significance and practical value.

These products not only promote cultural dissemination but also support the sustainable development of cultural heritage. Common examples include souvenirs, stationery, clothing, and home decor items that reflect a museum's identity and collections (Li et al., 2024). Museums as an important part of the cultural and creative industry have raised more and more attention recently because they can reflect the history of national culture and development which is conducive to enhancing national visibility (Kong, 2014). Most museums are public welfare infrastructures, with complex public cultural functions such as collection and exhibition. Therefore, they are rich in historical, artistic, and cultural resources. MCCP designs concerning the characteristics of museum collections, and has occupied a large proportion in the new round of consumption wave. (Alexander et al., 2017; Tu et al., 2019). MCCP mainly refers to special products that are creative, commemorative, and practical through the extraction and use of cultural and artistic elements. As a special cultural product, MCCP can achieve social education for a long time. On the one hand, for the museum, the efficient design of the cultural and creative product can create economic value (Li et al, 2021). On the other hand, for museum tourists, the MCCP can provide it with educational value.

As craftsmanship, the MCCP is easily trapped in the mud of development because of insufficient awareness of innovation, old operation concepts, and serious homogeneous competition (Kovach, 1989). Although there are many museums, there are generally single forms and slow innovation in the innovation of MCCP. First of all, the form of MCCP in most museums is relatively single. The advantage is straightforward, which can be produced in large quantities, the disadvantage is that the practicality is poor and lacks artistic value, and the MCCP of many museums stands still. Secondly, a considerable number of MCCPs have gradually entered the stage of standardization and industrialization, and the design and production technology content is relatively low. With the development of modern industrial production, MCCP has become a replica that can be produced in batches. The advantage of this replica is its low cost and fast production speed. The disadvantages are obvious the scarce products of the museum have become common goods, which have lost their original artistic taste and value.

Additionally, the development of social culture presents a new definition for cultural and creative products to prevent them from being disused. At present, the category of MCCP is roughly divided into cultural relics reciprocating products, office cultural supplies, book and video products, home daily necessities, jewellery, cosmetics, food, etc (Johnson et al., 2015). Many museums focus on simplistic designs, such as printing collection images on everyday objects resulting in product homogeneity and a lack of creativity. Such products struggle to evoke deeper cultural connections or narratives that attract and engage visitors effectively (Ren & Xu, 2021). In addition, most of the museum still adopts the traditional operation concept, which does not combine advanced network information technology. As a result, the rules and regulations of the museum are incomplete, the social ability is not strong, and the museums lack a certain social status and the masses' recognition (Hooper-Greenhill, 2007). Under the integration of emerging technologies, visitors can experience a multi-sensory immersive, and collaborative interactive feel, thereby stimulating visitors' comprehensive emotional cognition and emotional feedback. It grasps visitors' curiosity about cultural technology products, so that they can get a sense of satisfaction beyond expectations to promote consumption conversion (Pallud Monod, 2010). By advocating the integration of culture science and technology, the continuous injection of fresh vitality into the cultural and creative industry has brought more convenience and richer to cultural products.

Therefore, it is necessary to find a way to guarantee stable operation and economic increase for the museum with the help of cultural and creative product design.

1.2 Statement of the Problem

Product homogeneity has become a major problem in museum cultural and creative product development. The homogeneity of MCCP design is a major challenge that affects product appeal. As museums increasingly seek to monetize their cultural assets, many products end up being simple imitations that lack unique cultural elements. This lack of differentiation not only fails to meet consumers' changing aesthetic and cultural expectations but also leads to "aesthetic fatigue", that is, the sameness of products will reduce consumers' interest and willingness to buy (Tu et al., 2019). If the MCCP enters the mass consumer market, it must follow the popularity and choose a highly accepted cultural element. The inadequate cultural mining is the essential reason for the homogeneity of MCCP. Cultural and creative product designers ignore the understanding and expression of the spiritual connotation behind traditional culture to chase market trends. Some MCCPs lack the refining, mining, and creation of cultural relics elements. In addition, a relatively single manufacturing method is the surface reason for the homogeneity of MCCP. Due to the product attributes of MCCP, the best-selling MCCP needs to meet the multiple conditions of large quantities and affordable prices. The creative design will inevitably be limited by factors such as product materials, processes, and prices. Therefore, the manufacturing style is relatively simple (Tsang et al., 2022). Finally, the depth of the homogeneity of MCCP is that market research is not accurate enough. When conducting cultural and creative product design and development, many museums lack attention to consumer demand and have not conducted sufficient market research. From the perspective of cultural and creative design, many MCCPs are "similar but different samples" (Xiang, 2022). A large number of products produced and lacking new products have emerged. Cultural and creative designers should comprehensively investigate market data in a comprehensive level before

designing and understanding information such as consumers' needs, collecting hobbies, and consumer behaviour, so that later MCCP can have a better sale.

The museum operation concept is old, and the social functions of the development and circulation of MCCP are ignored. The museum's cultural and creative product development is a branch with huge growth potential in the cultural industry. Through the ideas of creative people, historical and cultural resources can be converted into MCCP with huge economic and social values (Basu & Modest, 2014). Then assists in the creation, application, protection, and management of intellectual property rights, it can gradually realize the economic value of sleeping cultural relic resources, and promote the improvement of the social and cultural environment and public cultural taste. The development and sales of MCCP are not only a complete marketization behavior, but also higher than the complexity of the real economic operation.

The technological content of MCCP needs to be improved. In the past few years, the development of MCCP is still in the starting stage of exploration, and the form of carriers has more seriously affected the recognition and reputation of MCCP (Kersten et al., 2017). As the development of MCCP is becoming increasingly mature, the carrier form of the product is usually mainly based on the actual objects at present, and the carrier form of physical products has become saturated. Relying on high-tech innovative cultural resource display methods, and improving experience and interaction is an inevitable trend in the transformation and upgrading of MCCP (Liu et al., 2024).

The problems and outcomes are presented in Fig.1.

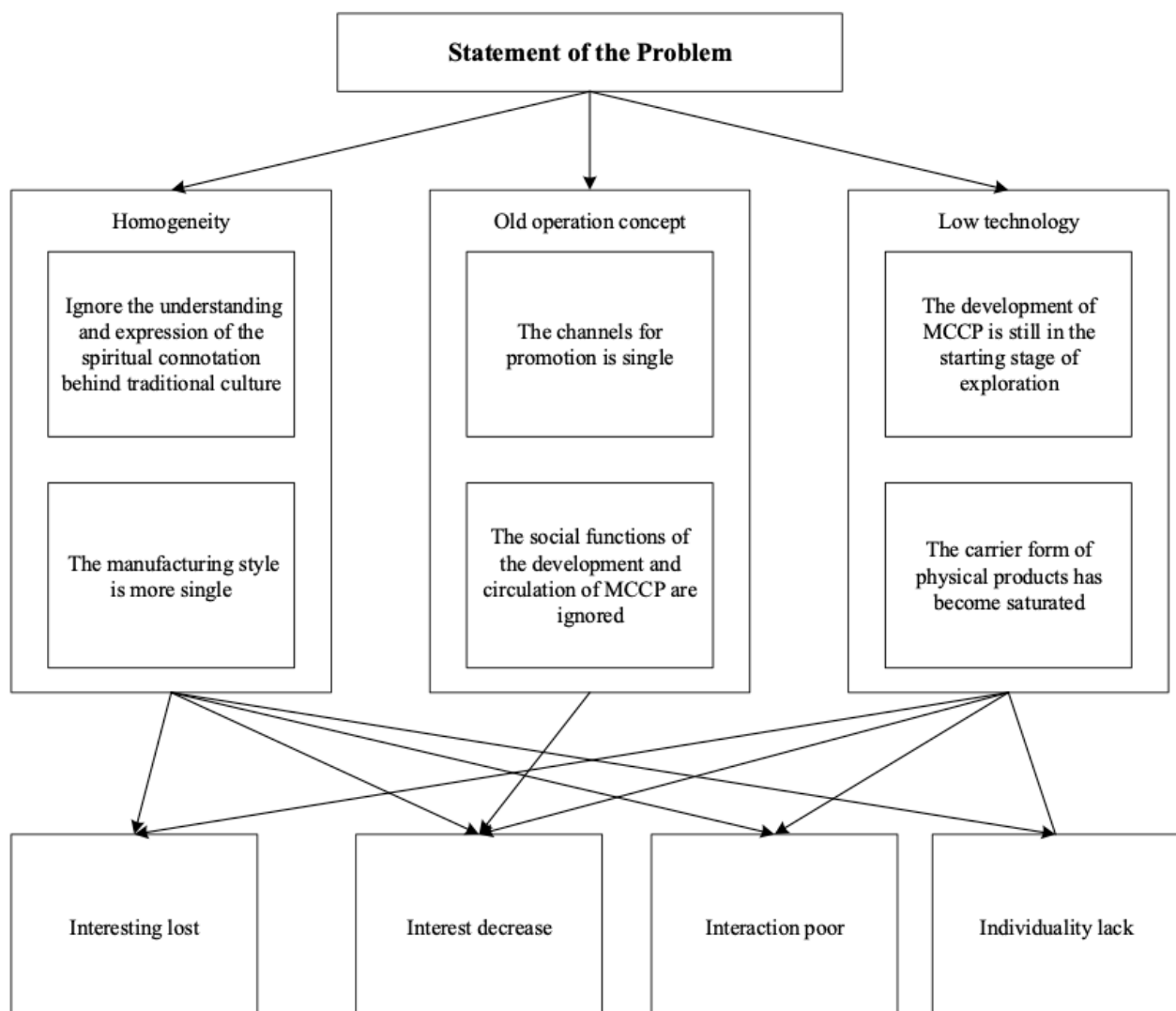


Figure 1: Current Problems and Its Outcomes

1.3 Research Objectives

RO1: Use the brand's effect to enhance the consumer and popularity of the product during the design of MCCP

RO2: Use high technology to improve the consumer experience in the design process of M CCP

1.4 Research Questions

RQ1: How to design products with cultural characteristics to avoid homogeneity and reflect the characteristics of the museum?

RQ2: How to achieve a diversified design and novel operation strategies, and increase product exposure and influence?

RQ3: How to improve the product's scientific and technological content, and increase the consumer experience and product quality?

2 LITERATURE REVIEW

2.1 Origin of Museum Creativity and Cultural Products

Culture not only provides rich materials and creative sources for the development of museum creative products but also guides the development direction of museum creative products (Fei & Chen, 2019). At present, some countries have formed a relatively complete industrial chain in the design, development, production, and sales of M CCP, and have mastered relatively mature development and operation experience. The most representative ones are the British Museum and the V&A Museum in the UK. As early as 1973, the British Museum established the British Museum Company with the concept of "bringing the museum with the garden home" as guidance, which includes a professional product sales team, and a large number of cultural creative product designs (Hui Wang, 2021). Each exhibition is a relatively independent cultural and creative product system. Wang Hui (2021) pointed out in the article that the products developed by the British Museum include but are not limited to Rosetta Stone derivatives, the London skyline, and a large number of IP cultural and creative products related to Hello Kitty and ancient Greek and Egyptian culture. For different exhibition questions, the British Museum will have a high degree of recognition of M CCP derived from the development of various M CCP for the development of various exhibitions and also promote its exhibition. The V&A Museum founded in 1852, now has been active in the design of cultural and creative circles in recent years. Similar to the development path of the British Museum, the Victoria and Albert Museum has also established a dedicated cultural and creative product business company. Its global projects cover various product categories from household items, clothing, and jewelry to stationery, crafts, etc. The main regions include the United Kingdom, Europe, the United States, and East Asia. In 2019, the V&A Museum launched more than 1,300 new products, expanding its product distribution network to more than 72 countries (V&A, 2024).

2.2 Diversified Design for M CCP

Liu et al. review recent research on M CCP design (Liu & Abidin, 2022). Twenty papers in the Scopus database from 2010 to 2022 emphasize that M CCP is a main part of cultural development and brings a large amount of social and economic benefits for museums. The relationship between M CCP and visitors can directly reflect the quality of design. Tu et al. perform a questionnaire on the visitors' comments on M CCP which are analyzed based on SPSS. Results indicate that visitors focus more on unique creativity and cultural connotation when selecting M CCP, and different gender shows a serious difference in the design of M CCP which points out the future direction for M CCP design (Tu et al., 2019). Owing to lacking objective and fast evaluation methods to discover the main factors for M CCP, Zhao presents a novel method to analyze the design of M CCP, it utilizes entropy weight to extract the main cultural features to instruct the design of M CCP. An example of a Qing dynasty museum demonstrates that the proposed method has advantages over cultural feature extraction, which is vital for the promotion of products and museums (Zhao, 2022).

2.3 Novel operation for M CCP

The importance of M CCP lies in its ability to achieve sustainable development of the cultural industry through innovative design from multiple angles (Liu & Abidin, 2022). Yang et al. propose the concept of "Emotion Retrospection" in M CCP to develop popular products with time labels and promotion of the broadcast of culture. They originally discussed the value and application of Emotion Retrospection in M CCP and brought a new future for M CCP (Yang et al., 2019). Song et al explore the process of M CCP development based on museum resources and present the update of M CCP from brand strategy and the level of product design. The performance and scientificity are also examined according to realistic examples (Song & Li, 2018). Li et al. conducted a questionnaire method to discover the main defects in M CCP design and operation. The results show that owing to the lack of innovation and low quality of operation, it is difficult to establish brand equity for a museum. It also utilizes comprehensive operation strategies to enhance the impact of M CCP and museums so that more and more visitors can be attracted (Liu & Lu, 2020).

2.4 High technology for MCCP

In recent years, the development of computer technology has had a strong impact on traditional industries, forcing them to upgrade. The application of immersive technologies such as augmented reality (AR), virtual reality (VR), and mixed reality (MR) in MCCP design has proven to be very beneficial (Li et al., 2023). Museums provide unique and fascinating experiences by blending real-world elements with digital content (Flavián et al., 2019). The adoption of these technologies has surged because they can create sensory-rich experiences that allow visitors to interact with cultural artefacts and historical contexts in unprecedented ways (Lee et al., 2020). Sijing et al. propose a new generation of MCCP based on user experience and cultural research and a new design for MCCP from “Virtual +Reality” mode (Sijing & Lie, 2020). To better improve the efficiency of MCCP design, Yu embeds artificial intelligence into the development of MCCP through machine learning and computer vision, which employs historical data to revise the status of MCCP. Results show that the efficiency of MCCP design improved by 43% and computer technology has an impressive influence on MCCP (Yu, 2022).

3 RESEARCH METHODOLOGY

3.1 Research Design

The 4i theory was proposed by Donschultz, a professor of marketing at Northwestern University in the United States in the 1990s (Schultz, 2003). The theory mainly includes four principles: the principle of Interesting, Interests, Interaction, and Individuality, it emphasizes that consumers are interested in an interesting way, guides consumers in a way conducive to consumers, and participates in interaction with brands and products. Creativity has resonated with consumers. The 4I theory was applied to the design of MCCP, and by adopting the analytical method of a questionnaire survey and combining the relevance of the original theory, explored the innovation path of MCCP from four dimensions.

Interesting designs can make peoples' reception of product information from passive to active, which is more likely to resonate with consumers (Ma et al., 2022). The Interesting cultural and creative products in the museum reflect that people can feel pleasure. The museum's cultural and creative products should give full play to the advantages of resource allocation, find accurate entry ports, and present the products to the public more innovatively and interestingly.

The museum's cultural and creative products will involve multi-party interests. Interests can include material, information, services, functions, psychological satisfaction, etc for consumers (Oliver, 2014). It also includes the reputation, market conversion rate, and dissemination scope for museums.

Museum's cultural and creative products need to be in line with the new trend of cultural consumption and strengthen the interaction and experience of cultural and creative products (Liu & Lu, 2020). It is necessary to get close to the consumer, taking consumers as the main body to interact with the products and generate an emotional resonance through deeply thinking about the cultural connotation contained in the product.

The consumption concept of the public today is more inclined to be personalized and emotional. When purchasing museum cultural and creative products, consumers gradually shift from rational purchasing behavior based on considerations of product practicality and usability to impulsive and emotional consumption driven by product design, fun, and personality. Museum's cultural and creative products should conduct in-depth investigations on consumer and market demand (Tu et al., 2019). Based on fully understanding the connotation and consumer characteristics of the product, refine the needs of consumers, and conduct targeted cultural and creative product design and development, to meet consumers' individuality demands. The framework of the 4I theory is presented in Fig.2.

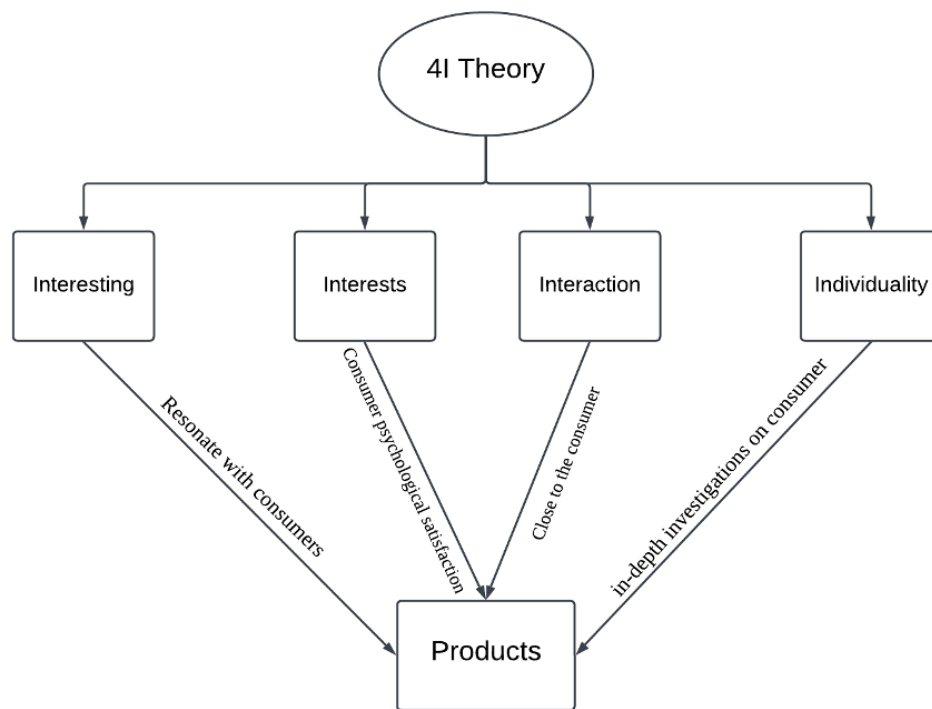


Figure 2: 4I theory framework adapts

To handle current problems in the design of MCCP, referring to former research, this paper proposes proposals as follows with the guidance of 4I theory.

The proposals dealing with homogeneity through the 4I theory are presented as follows.

(1) Strengthen the graphic visual creative design of cultural products to enhance the graphic art visual effects of the cultural products of the museum (Luo, 2021). In the creative design and development of cultural products of the museum, the graphic design of cultural and artistic products is a direct factor that reflects its artistic effects and cultural value, and it is also a reflection of the integration of the historical and cultural connotation of cultural relics in museums (Galloway & Dunlop, 2007). The extraction of its visual elements relies on the rich cultural heritage and rich cultural relic treasures of the museum which combine with historical culture and easily get visitors interested, elemental innovation as the core, combined with local regional cultural characteristics, can well avoid the homogeneity. Therefore, in the creative design of museum cultural products, it is necessary to pay attention to the innovation of graphic visual design, realize the modern design and development of the MCCP, and meet the actual needs of consumers in modern markets.

(2) Strengthen the personalized and innovative design of consumers of cultural products to meet the market demand for consumers' personalized design and development of cultural products. Consumers are the ultimate audience and market consumer main body of museum cultural products (Liang & Li, 2020). In the actual process of MCCP, consumer design experience participation is extremely necessary. Only consumers participate and design from their personality, which can not only avoid homogeneity but also resonate with consumers. Therefore, in the personalized creative design of museum cultural products, it is necessary to strengthen the consumer personalized design participation experience, collect consumers' demand for the personalized creative design of museum cultural products, and provide guidance for the personalized creative design development of the museum's cultural products.

(3) The design of MCCP from a single factor is inevitable to be trapped in the same products, the fusion of multicultural elements that strengthen cultural products' creative design can be inherited in modern society. In the design of the museum's MCCP, it is difficult to meet the market demand of consumers in a single form of culture, and it is necessary to pay attention to the interaction integration of multiculturalism. In the actual process, a modern technology system can be used to combine the cultural system and historical cultural relics and creative products that are closely related to the historical and cultural products of the museum's cultural relics to develop unique products for the museum, achieving the inspiration of the psychological and consumer enthusiasm (Junran, 2022).

The proposals dealing with the old operation concepts through 4I theory are presented as follows.

(1) Cross-border cooperation and brand joint are the trends in the cultural and creative industry of museums in recent years (Ma et al., 2022). At present, the development direction of joint products has a multi-point combination,

market-oriented, and keeping with the characteristics of the times. The brand joint between museums. museums that have similar factors can be jointly cooperated. Culture is never isolated, and history is continuous. Digging the internal connection between cultural relics turns similar museums into an organic whole, which can maximize the common cultural symbols between them, and it is easier to expand the influence of culture. The museum's cultural and creative brand joint is not only limited to the country but also facing the world. The brand joint of different countries can collide with special sparks. Similar cultures can be expanded, and cultural differences can inspire creativity. Whether it is "seeking the same" or "looking for differences", the effect of one plus one is greater than two.

(2) Brand joint for emerging industries (Zhang, 2022). In the retro design of the clothing industry, its production and design must be based on existing ancient clothing materials, which is destined to have thousands of connections with the museum in the clothing industry, and it also provides the cooperation possibility. When choosing a joint clothing brand object, the museum does not have to be aligned with well-known brands. It is good for the museum to open its popularity and is a good partner for small and medium-sized museums.

The proposals dealing with low technology through 4I theory are presented as follows.

(1) Rely on modern technology to improve the production technology of MCCP (Romanelli, 2020). In the process of innovation of MCCP, the use of modern technology can allow MCCP to have a broader development space, and at the same time, it can also enhance the technological content of MCCP and increase its added value. Compared with traditional production technology, high-tech production technology can effectively improve the quality of product design, meet the aesthetic needs of modern people, attract visitors' interest, and promote traditional culture to be easily accepted by people. Therefore, in the process of innovation of MCCP, the production process behind the cultural relics behind the museum must be tapped, and it combines with the current popular things to use traditional manufacturing technology to make modern production technology that conforms to modern times.

(2) The emergence of video games undoubtedly provides a new direction for the joint development of the museum. The similarity of the cultural core is more conducive to resonance. To inherit and develop traditional culture, it is necessary to break the dimensions and integrate into the young group. Cross-border is not only a shared brand effect and resources but also expresses the cultural relics in a way to makes culture and creativity feel intimate. Through emerging industries to recover and show sleeping cultural relics, and to create more high-quality MCCP based on the museum culture, there is a need for the development of the cultural and creative industry of the museum, and it is also the need to expand the cultural image power and inherit culture (Li & Ghirardi, 2019). Brand joint with high-tech industry, the exposure and popularity of MCCP get further enhanced and the interests of the museum get increased, which is beneficial for the long development of the museum.

(3) The Metaverse is a virtual world that uses science and technology to link and create and has a digital living space with a new social system. In the Metaverse, the user can see, hear or even touch, presenting a virtual world for the user which improves the interaction to a large extent. The museum should keep up with the times to seize new opportunities to welcome new challenges, actively participate in the construction of the Metaverse, and explore the standards and specifications of the museum field construction standards. Develop holographic imaging projection, create the feeling of crossing time and space, and let the reality and the ancient interests produced in ancient times achieve the fun of crossing and interest in historical and cultural research (Calcagno & Biscaro, 2012). In the future, we may be able to see that each spiritual network is split and reorganized, and the boundaries between museums will be broken (Xu, 2017). What will be recreated will be a museum's spiritual network, surpassing time and space, long-lasting. In this virtual world, the MCCP may no longer be a single real thing, but a key, which can build interactions with any museum, which is infinitely closer to the distance between the museum and the public. The cultural and creative industry of the museum needs to be based on "technology+culture" and "digital+protection" to conduct a comprehensive and multi-channel link through industrial integration to form a complete industrial chain and shape the unique brand of MCCP, to achieve the value of the cultural and creative industry of the museum sustainable development.

(4) Promote the organic fusion of scientific technological and cultural creative products (Li et al., 2021). The design and development of MCCP are inseparable from the strong support of science and technology. Organizing the organic integration of culture, creativity, science and technology, and art design can enhance the competitive advantage of MCCP in the market (Della Corte et al., 2017). The museum's cultural and creative product designers can introduce advanced information technology to help cultural and creative product art design, use high information technology to show the museum's unique personality, and realize the efficient spread of MCCP and the cultural information they carry. Therefore, museum cultural and creative product art design should give full play to the advantages of information technology, and strengthen information construction (Cai, 2022).

The whole proposed method of MCCP to deal with homogeneity, old operation concept, and low technology through 4I theory is presented in Fig.3.

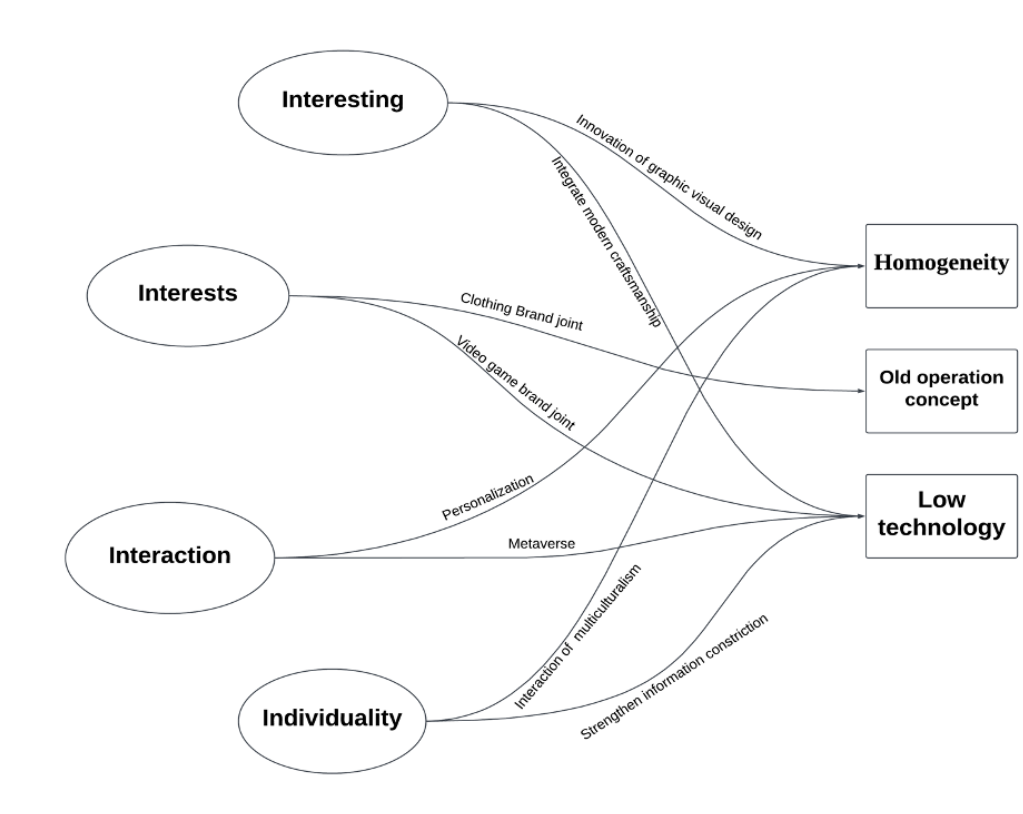


Figure 3: Proposed method

3.2 Population and sample

Our sample comes from the consumer group of our school's cooperative enterprise Z. We adopted a voluntary filling method and sent a Google questionnaire to consumers who voluntarily subscribed to Z company's push information via email. A total of 572 questionnaires were collected, and 64 questionnaires with too long time or too high answers were deleted. Finally, 508 valid questionnaires were obtained, with a collection rate of 88.81%.

3.3 Sampling Technique

The questionnaires were collected from July to September 2024. The survey was divided into three time periods: holidays, weekdays, and weekends. The number of visitors during holidays was the largest, while the number of visitors on weekdays and weekends was relatively small.

3.4 Instruments

The collected data were analyzed based on SPSS 26.0. to investigate visitors' intentions to MCCP.

3.5 Method of Data Collection

In this questionnaire, the author can understand the willingness of customers, including gender and age, the channels for the cultural and creative product, the purchasing tendency, the purchase factors, the purpose of the purchase, and the consumer's opinions on the development of the MCCP.

3.6 Method of Data Analysis

First, to understand the basic situation of data samples and various variable scores. Using frequency analysis methods to understand the structure of the sample, such as the proportion of males and females, and the number and ratio of different income groups. Using descriptive statistical analysis methods to understand each variable, such as satisfaction, attitude, etc. Then, to understand the mean differences in specific variables at different classification or packet variables, such as the

purchase intention of males and females, and the degree of product preferences of consumers at different income levels. Then reliability analysis was conducted to analyze whether the questionnaire designed by SPSS analysis was reliable and whether there was a good correlation between the questionnaire questions. The validity test was mainly based on KMO analysis to evaluate the feasibility of factor analysis of samples and the Butlet test was used to illustrate the correlation between variables. Finally, exploratory factor analysis was conducted through rotation analysis to explore the potential factor structure of the model.

4 RESULTS AND FINDINGS

4.1 Result for Testing Main Research Questions

As can be seen from Figure 4, for MCCP products, product features influence 67% of user purchasing factors. When consumers come to a place, the way that understand the culture of a museum is mainly through local specialty products. Therefore, when developing MCCP, it should pay more attention to the characters of the museum.

Secondly, consumers also have high requirements for product quality, price, and practicality, which account for 48%, 38.5%, and 34% respectively. Product quality is another important factor for a product. The price also should be reasonable. In addition, developing MCCP should pay attention to practicality, unreasonable products gradually fade out of people's lives.

Third, carrying and material are also more concerned which account for 23% and 20.5% respectively. Because most of the visitors visiting the museum are foreign tourists, they all hope that products can be easy to carry. Everyone has different requirements for product materials. Services and packaging are the least valued by consumers, accounting for only 13.5% and 12.5%, but high-quality services will make consumers feel that they are at home, and exquisite packaging will also increase the style of the museum to a certain extent.

Among the consumers who purchase MCCP, only 18% of consumers believe that the packaging is more exquisite, more than half (53%) of consumers believe that the packaging is relatively simple, 20% of the packaging is not focused on packaging. 9% of consumers believe that no packaging. Among consumers without shopping, 36% of consumers did not purchase because the price of the product was too high.

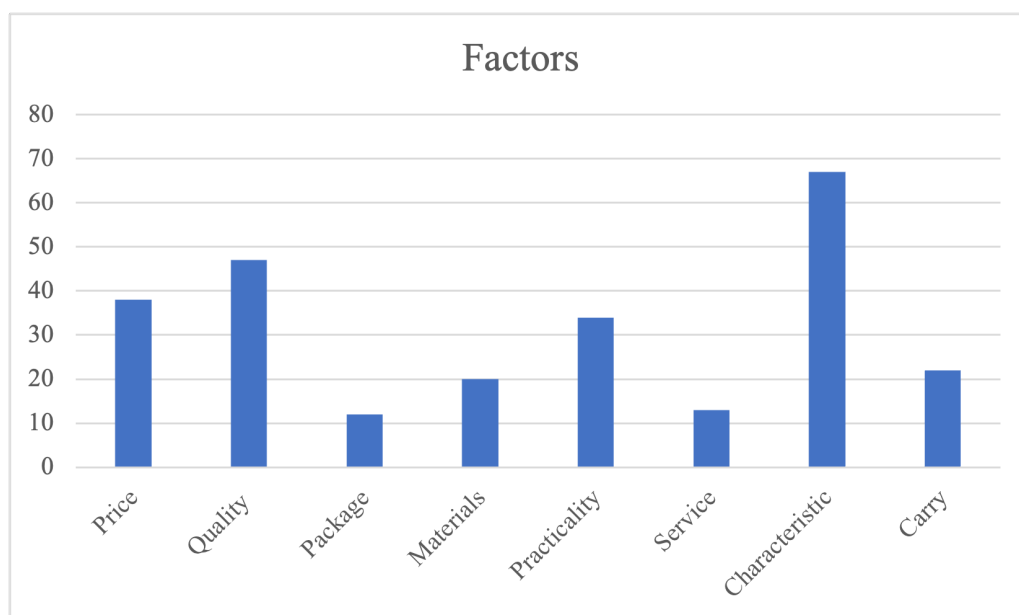


Figure 4: Main Factors of Consumer Purchase

It can be seen from Fig.5 that consumers believe that the MCCP developed by the museum is not distinctive enough, accounting for 35%, the lack of creativity accounts for 34%, the lack of practicality accounts for 26%, the packaged packaging accounts for 13%, 7% of the quality problems. The characteristics and creativity account for the most, more than half of it. Consumers recommend that the museum will increase their creativity and characteristics in the future, and practical value must also be taken into account at the same time. The packaging of the product is equally important. Although consumers are not so high in packaging, the museum cannot still be taken lightly. The exquisite packaging will also add a lot of value to the product. Consumers believe that there is the least proportion of MCCP is the quality of MCCP. However, some consumers believe that the quality of some products is defective, and the price formulation is not

reasonable. In addition, in the survey of consumer questionnaires, 12 people believed that the MCCP developed by the museum was perfect and there was no shortage. Consumers hope that the museum will make persistent efforts to develop and develop more MCCPs that make consumers convinced.

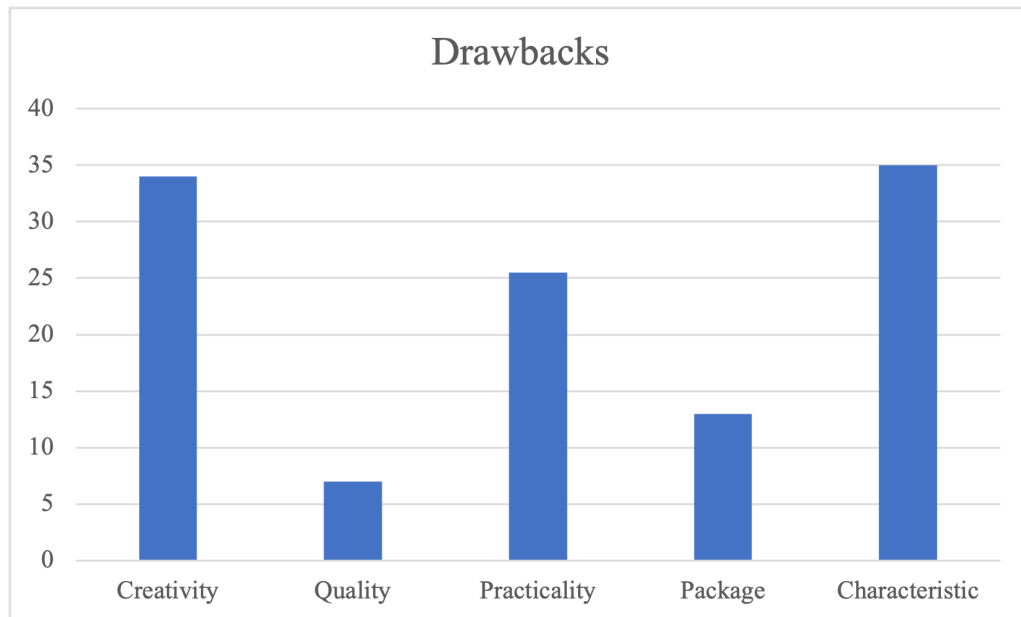


Figure 5: Main Drawbacks

It can be concluded that the characteristic is the most concern among the main factors of consumer purchase, which is the same as the RO1. At the same time, the highest percentage of Creativity and Characteristics in Fig.5 among the main drawbacks also answers RQ1.

In the questionnaire, six channels named the network, television, newspapers and magazines, display, friends' recommendation, and museum website were analyzed, In Fig.6, it can be seen intuitively that nearly half of the consumers noticed the cultural and creative stores of the museum when visiting the museum. One quarter was recommended by friends. The other channel percentages are all smaller than 10%. It can be concluded that the channels for MCCP broadcasting are relatively single. Therefore, the single publicity channel will become part of the factors that restrict the sales of MCCP.

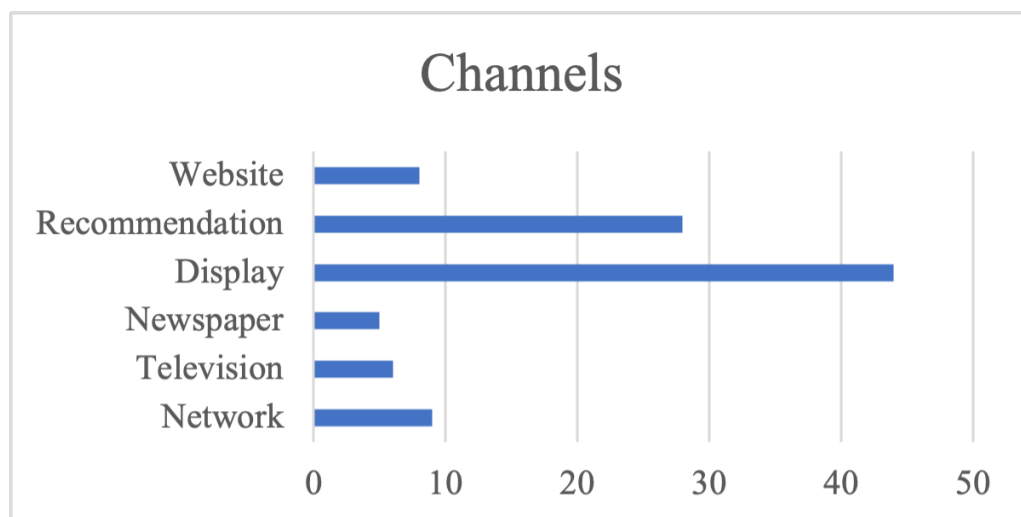


Figure 6: Channels of Consumer

From Fig.6, we know that the main channel of the consumer is Display, which means that the main purchase intention is related to the first see of products. However, the broadcast of the museum is limited, Combining the powerful broadcast capacity of the brand and introducing the brand joint is important for product exposure, which answers the RQ2.

From Fig.7, it can be seen that 43.5% of consumers believe that the museum lacks experience and creative products. Most consumers are willing to conduct their own experience during the consumption process where they have a deeper feeling after experiencing. In addition, creative products account for 37%, with a large number of people. In the process of developing MCCP, "creativity" is the soul of product development. Specialized products account for 35.5%, and specialized products are MCCP designed only for consumers of all ages. For example, at the student stage, the need for stationery is the most demand. Workers and families use more frequently for office supplies and family supplies.

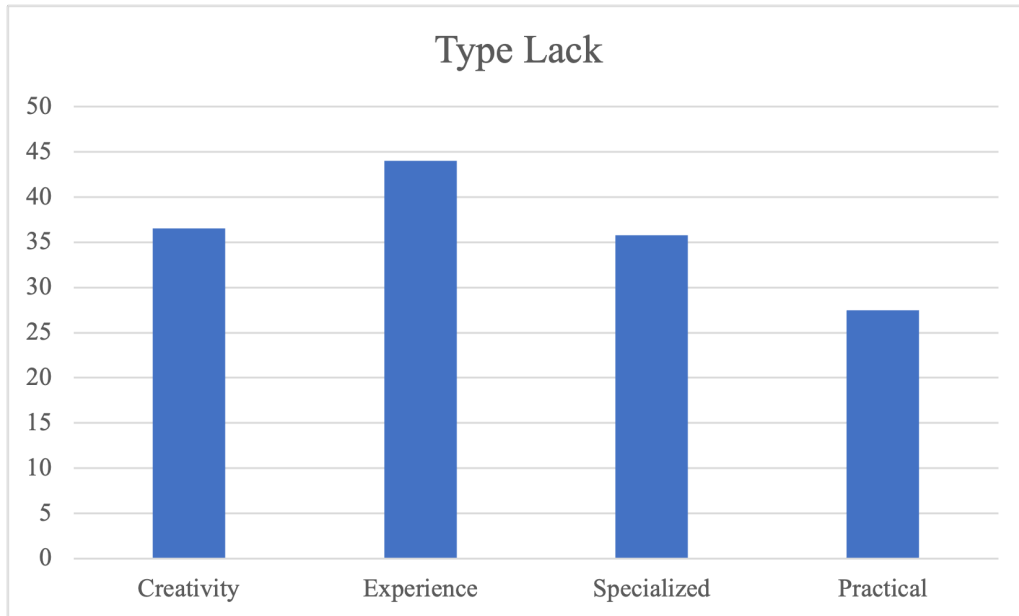


Figure 7: Type Lack of MCCP

Fig.7 describes that the main lack of creative and cultural products in museums is Experience. In reality, there are lots of experience styles in current museums, why Experience accounts for the highest percentage among types lacking. The reason is that the current experience is boring and can not impress consumers. If some high technology is introduced into the design process, such as Metaverse, the experience is more interesting and will give consumers an impressed memory, which answers RQ3.

4.2 Quantitative Findings

According to Fig.8, we can see that among the customers who come to the museum, women account for 59.5%, and men account for 40.5%, which may be related to the nature of women's shopping willingness. Among the age distribution, the 15-25-year-old young people account for 46%. Most of these people are students who go to college and come out during the holidays. The second is 25-40 years old who has a stable job and has a certain level of consumption, accounting for 36%. The age group of 40-60 is relatively small, and the proportion of under 15 and over 60 years old is the least. Children under 15 are accompanied by their parents. Most consumers over the age of 60 are visited with the tour group. Due to the limited time, there is no way to fill in the questionnaire.

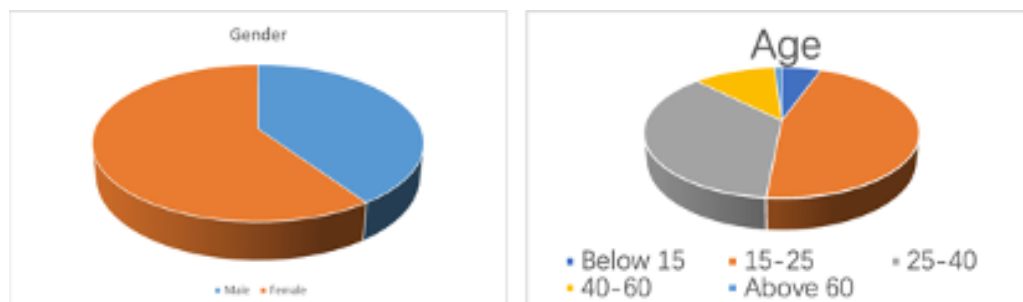


Figure 8: Percentage of Gender and Age

It can be seen from Fig.9 that consumers have a large tendency to buy special products, accounting for 37%. Local

specialty products are a microcosm of a region. Generally, consumers will understand the local culture through special products. Consumers' purchase tendency for the purchase of collections, fun life, creative stationery, and decoration is around 15%.

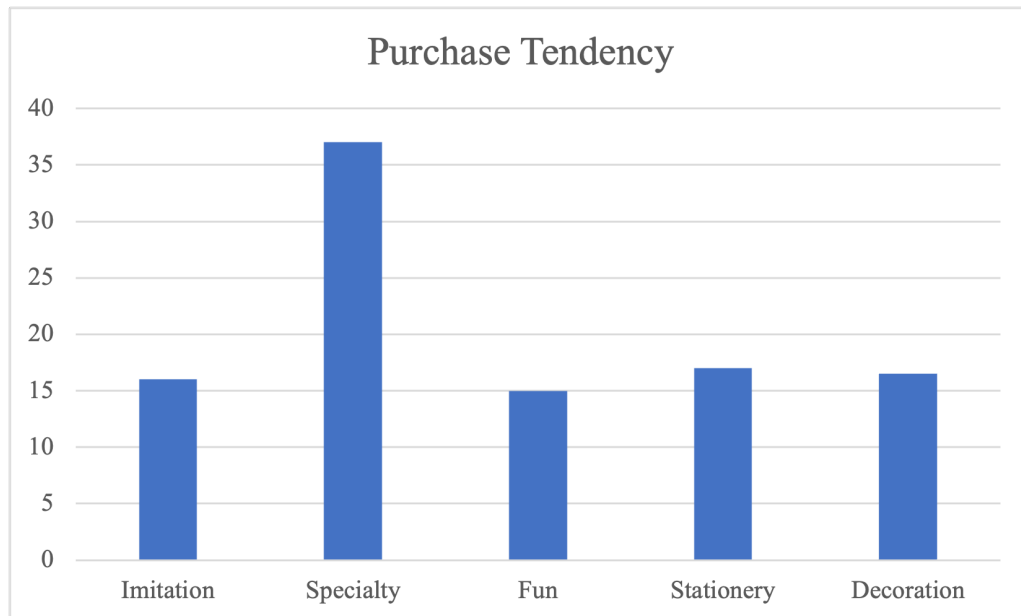


Figure 9: Main Types of Consumer Purchase Tendency

In Fig.10, consumers' excavation of MCCP attaches the most attention, accounting for 66.5%. In the process of developing MCCP, "culture" and "creativity" are the top priorities, and the two are indispensable. Secondly, the proportion of types, brands, and environmental protection is not much different, which accounts for 28%, 26.5%, and 26% respectively. Generally, brands are quality assurance. Establishing a brand can protect consumers' rights and interests, and enable consumers to correctly identify the source of products, and good brands will also form a guiding role.

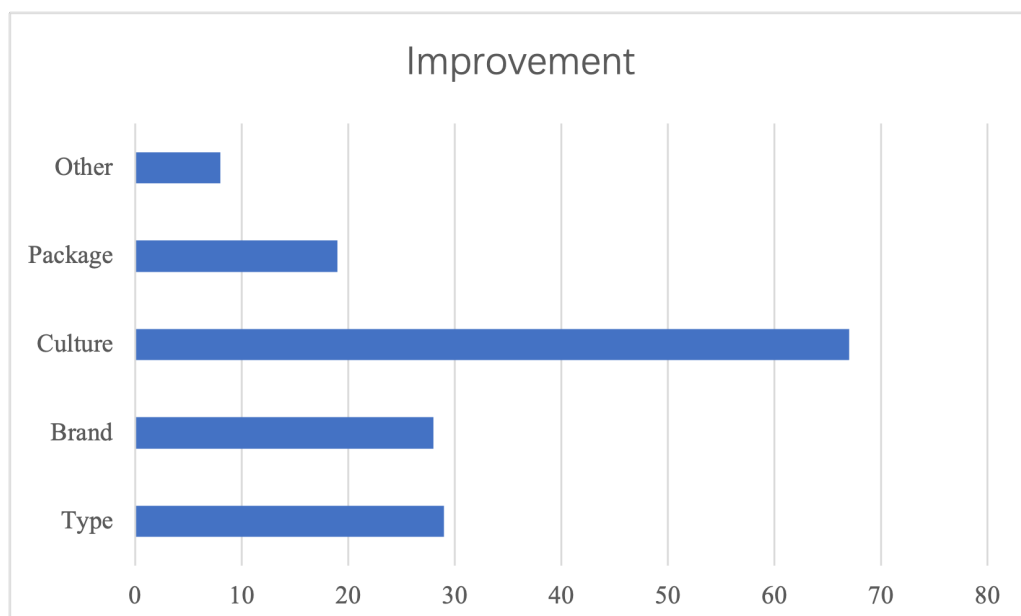


Figure 10: The Direction of Improvement

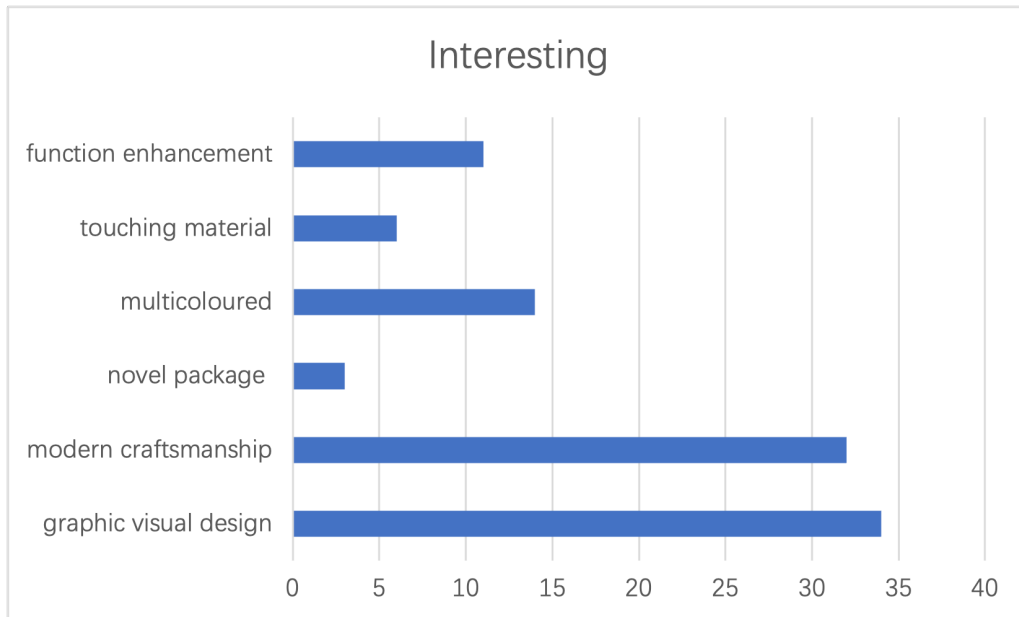


Figure 11: Results on how can improve the interest of M CCP

In this interview, interviewers are asked how can improve the interest of M CCP. Fig.11 presents the analysis from Interesting, we can see that the novel package is the least, which only accounts for 3%. The result is also the same as Fig.4 in which only a few consumers concentrate on the package. The touching material also accounts for a lit with 6%. Graphic visual design and modern craftsmanship account for the most, which are 34% and 32% respectively. It indicates that the proposed graphic visual design and modern craftsmanship meet current consumer demands. At the same time, the percentage of multicolored is 14%, which means that consumers have a demand for visual design and further illustrates the effectiveness of graphic visual design.

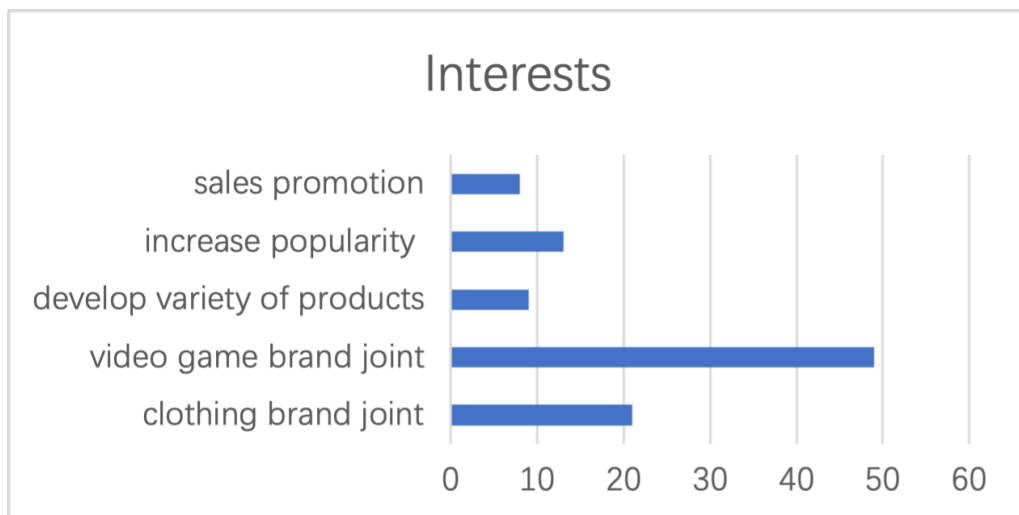


Figure 12: Results on how the museum can increase its interests

In this interview, interviewers are asked their opinions on how the museum can increase its interest. Fig.12 presents that the video game brand joint almost accounts for half, with 49%percentage, this may be attributed to the most distribution of age is 15-25 where a large number of interviewers naturally have a preference for video games. The percentage of clothing brand joints ranks second, with 21%, because the age of 25-40 also has demand for clothing purchase. Sales promotion and variety of product development account for the least, because sales promotion is worse if the products are of poor quality and more types of products may cause fatigue in consumers.

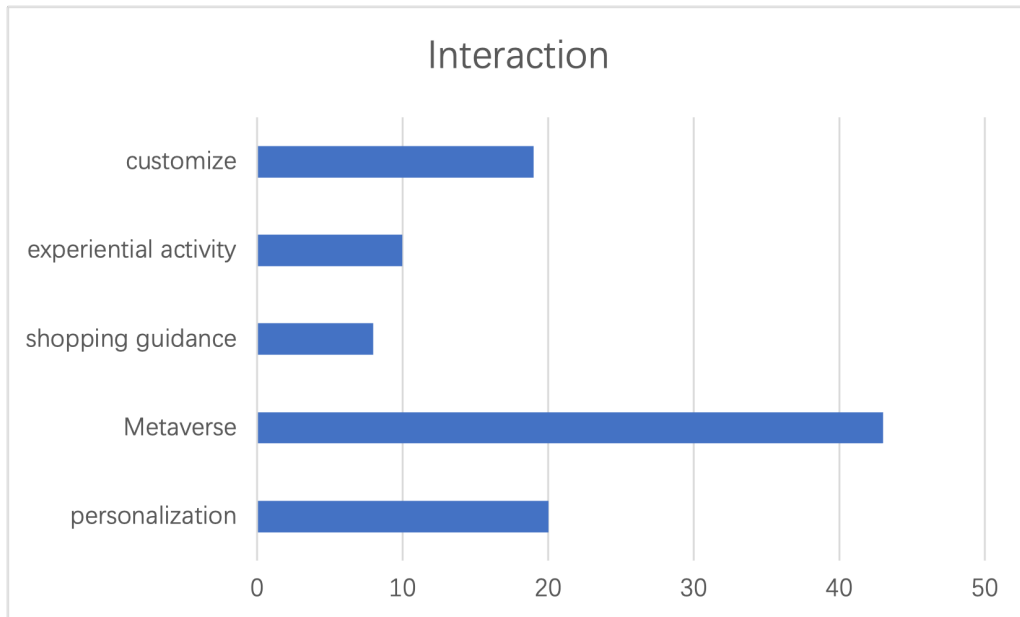


Figure 13: Results on which styles of interaction are they preferred

In this interview, the interviewers are asked which styles of interaction they prefer. Fig.13 demonstrates that the percentage of the Metaverse is the highest, with 43%. It is worth noting that some interviewers do not know about the Metaverse at first, but after some brief introduction, they choose the Metaverse with certainty. Personalization and customize almost account for the same, with 20% and 19%, which indicates that consumers have more demand for personalization. Realistically speaking, whether the production time or the cost of production, the personalization is superior to the customize. The shopping guidance accounts for the least, with 8%, which is consistent with Fig.4 that the service only has a lit concern.

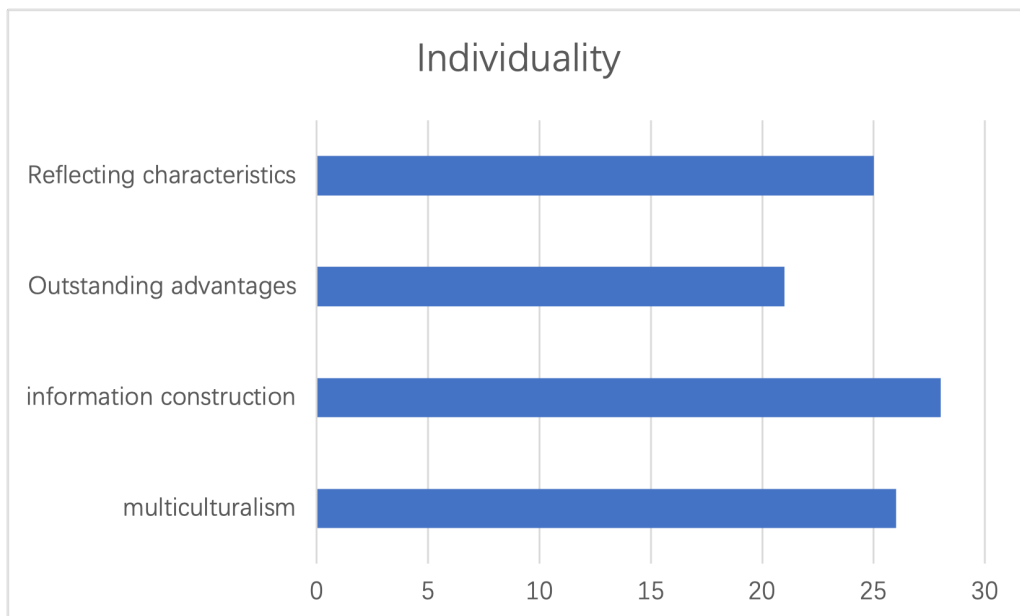


Figure 14: Results on how can MCCP increase its Individuality

In this interview, the interviewers are inquired how can MCCP increase its Individuality. Although Fig.14 shows that the difference between the 4 types is small, with 28% on Information construction, 26% on multiculturalism, 25% on reflecting characteristics, and 21% on outstanding advantages, multiculturalism is beneficial for outstanding advantages and information construction has advantages in reflecting characteristics.

4.3 Qualitative Data Analysis

See Tab.1, a descriptive analysis of the measurement indicators involved. The measurement score of the average value of the survey data reflects the average size state of a certain measurement indicator in the sample. It can be seen from Tab.1 that the absolute values of each measurement index bias are less than 3, and the absolute value of the peak degree is less than 10, which shows that the measured data is basically in line with the positive distribution, and the next analysis can be made through the relevant indicators.

Table 1: Descriptive Statistical Analysis of Measurement Indicators

ID	Measurement Indicators	Mean	SD	Skewness	Kurtosis
A1	The uniqueness of cultural and creative products	3.16	1.110	-0.026	-0.582
A2	Price of cultural and creative products	3.82	0.878	-0.508	1.171
A3	The quality of cultural and creative products	3.65	0.984	-0.108	-0.931
A4	Design style of cultural and creative products	3.57	0.842	-0.415	-0.509
A5	Packaging of cultural and creative products	3.53	0.879	-1.012	1.163
A6	Types of cultural and creative products	3.78	0.832	-0.273	-0.313
A7	The practicality of cultural and creative products	3.52	0.821	0.003	1.308
A8	The portability of cultural and creative products	3.57	0.971	-0.768	0.562
A9	Monument to cultural and creative products	3.78	0.975	-0.866	0.935
A10	Experience of cultural and creative products	3.19	1.120	-0.100	-0.654
A11	The historical and cultural value of cultural products	3.56	0.829	-0.285	-0.579
A12	Collection value of cultural and creative products	3.43	0.879	-1.008	1.842
A13	Publicity of cultural and creative products	3.39	1.071	-0.673	-0.326
A14	Shopping environment of cultural and creative products	3.50	0.822	-1.425	0.388
A15	Quality of cultural and creative product service personnel	3.46	1.070	-0.516	-0.273
A16	Attitude of cultural and creative product service staff	3.54	0.827	-0.452	0.731

Under normal circumstances, the average score of the Lockerte Table 1-5 is a sign of opposition between 1-2.4, holding a neutral attitude between 2.5-3.4, and the average value before 3.5-5 means support. From the descriptive analysis table of measurement indicators, it can be seen that in addition to the indicators of "The uniqueness of cultural and creative products", "Experience of cultural and creative products", and "Collection value of cultural and creative products" and "Publicity of cultural and creative products", the average of each indicator values are higher than 3.5. Overall, tourists' evaluation of the cultural and creative products of the museum performed well. However, the scores of A1 and A10 present the lowest among the 16 scores which means that current uniqueness and experience are not satisfactory.

The Cronbach's coefficient can make a reliability analysis of the questionnaire. equal to or larger than 0.80 means the outcome is very good. it is better to be between 0.70 < 0.80 means the outcome is relatively good. 0.65 < 0.7 means the outcome is acceptable. < 0.65 means that it is not acceptable (Cronbach, 1951).

As shown in Tab.2, the two measured values are above 0.85, indicating that the consistency of the questionnaire is better and has a certain credibility.

Table 2: Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.859	0.867	60

Analysis of the validity of the questionnaire. In the KMO test: $KMO > 0.9$ means very suitable, $0.8 < KMO < 0.9$ means relatively suitable, $0.7 < KMO < 0.8$ means generally suitable, $0.6 < KMO < 0.7$ means reluctant, $0.5 < KMO < 0.6$ means not very suitable; $KMO < 0.5$ means not suitable.

KMO and Butlet tests (as shown in Tab.3) are performed on relevant data of the MCCP. The KMO value is 0.709, according to the KMO inspection standard: $0.7 < KMO < 0.8$, indicating the questionnaire can reflect the problem of research. In Bartilit's spherical testing, it is significantly less than 0.05.

Table 3: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.709
Bartlett's Test of Sphericity	Approx. Chi-Square	469.379
	df	153
	Sig.	0.000

An exploratory factor analysis of 16 indicators of MCCP to summarize 16 variables into several categories of "factor", several types of factors with strong correlation are attributed to one category describes many of the original indicators with relatively comprehensive indicators, thereby reducing the difficulties brought by the indicators. This paper uses the main component analysis method to extract the common factor with a feature value greater than 1. The following table is the interpretation of the difference between the original variable squares. The characteristic root is greater than 1 as the standard. There are 5 factors extracted and the overall variance is 68.477%.

Table 4: Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.887	21.595	21.595	3.887	21.595	21.595
2	1.950	10.831	32.426	1.950	10.831	32.426
3	1.681	9.337	41.763	1.681	9.337	41.763
4	1.440	8.000	49.763	1.440	8.000	49.763
5	1.208	6.714	56.477	1.208	6.714	68.477
6	0.974	5.966	62.443			
7	0.957	5.318	67.761			
8	0.908	5.119	69.431			
9	0.870	4.831	72.592			
10	0.842	4.602	74.873			
11	0.796	4.423	77.014			
12	0.700	3.889	84.881			
13	0.637	3.571	86.186			
14	0.573	3.182	88.063			
15	0.503	2.795	90.858			

Next, through the maximum variance method, the required data rotation analysis is performed.

Factor 1 includes "uniqueness of cultural and creative products", "quality of cultural and creative products", "price of cultural and creative products", "design style of cultural and creative products", "types of cultural and creative products", "cultural and creative products", "cultural and creative products", "types of cultural and creative products", "types of cultural and creative products", "types of Packaging " measurement indicators.

Factor 2 includes four measurement indicators of "practicality of cultural and creative products", "portability of cultural and creative products", "commemoration of cultural and creative products", and "experience of cultural and creative products".

Factor 3 includes two measured indicators of "historical and cultural value of cultural and creative products" and "collection value of cultural and creative products".

Factor 4 includes two measurement indicators of "Publicity of Cultural and Creative Products" and "Shopping Environment of Cultural and Creative Products".

Factor 5 includes two measurement indicators of "Quality of Cultural and Creative Product Services", and "Cultural and Creative Product Service Staff Attitude".

Table 5: Rotated Component Matrix

Measurement Standard	Factors				
	1	2	3	4	5
The uniqueness of cultural and creative products	0.623				
Price of cultural and creative products	0.819				
The quality of cultural and creative products	0.746				
Design style of cultural and creative products	0.783				
Packaging of cultural and creative products	0.648				
Types of cultural and creative products	0.801				
The practicality of cultural and creative products		0.827			
The portability of cultural and creative products		0.575			
Monument to cultural and creative products		0.741			
Experience of cultural and creative products		0.572			
The historical and cultural value of cultural products			0.793		
Collection value of cultural and creative products			0.724		
Publicity of cultural and creative products				0.688	
Shopping environment of cultural and creative products				0.631	
Quality of cultural and creative product service personnel					0.651
Attitude of cultural and creative product service staff					0.609

This section began to analyze the average value of each indicator and then inspected the reliability of the research data. The 5 factors, 4 indicators, and the overall score are shown in Tab.6.

Table 6: Overall Score

Description	Indicator	Average
Museum's characteristics of cultural and creative products (3.585)	The uniqueness of cultural and creative products	3.16
	Price of cultural and creative products	3.82
	The quality of cultural and creative products	3.65
	Design style of cultural and creative products	3.57
	Packaging of cultural and creative products	3.53
	Types of cultural and creative products	3.78
The attributes of M CCP (3.515)	The practicality of cultural and creative products	3.52
	The portability of cultural and creative products	3.57
	Monument to cultural and creative products	3.78
	Experience of cultural and creative products	3.19
Value (3.495)	The historical and cultural value of cultural and creative products	3.56
	Collection value of cultural and creative products	3.43
Publicity and environment (3.445)	Publicity of cultural and creative products	3.39
	Shopping environment of cultural and creative products	3.50
Service (3.5)	The quality of cultural and creative product service staff	3.46
	The attitude of cultural and creative product service staff	3.54

Among the five main categories, tourists pay the highest attention to the museum's characteristics of cultural and creative products, which is 3.585. In addition, tourists' attention to the attributes of M CCP is relatively high. It also focuses on the Service of M CCP, which is 3.50, in contrast, there is low attention to the Publicity and environment, with 3.445.

In 16 sub-categories, "Price of cultural and creative products (3.82)", "Types of Cultural and Creative Products (3.78)", "Monument to Cultural and Creative Products (3.78)", "The quality of cultural and creative products (3.65)" is the four aspects of the highest degree of attention, and tourists likely have a positive perception of the cultural and creative products.

In the 16 sub-categories, the lowest scores of "The uniqueness of cultural and creative products (3.16)", "Experience of cultural and creative products (3.19)" and "Publicity of cultural and creative products (3.39)" were scored at the lowest score. It may be a negative perception of tourists' existence of cultural and creative products.

5 DISCUSSION AND CONCLUSION

5.1 Summary of the study

MCCP are the communication channels for expanding the cultural volume of museums, or a large carrier to display the aesthetic and artistic functions of the museum's cultural relics. However, the current design of MCCP is trapped in Homogeneity, old operation concepts, and low technology. To handle those drawbacks, this paper proposes to guide the design based on the 4I theory. Firstly, the Interesting is proposed to perform innovation of graphic visual design to show the difference and the integration of modern craftsmanship is introduced to increase the technology. Secondly, the Interest is proposed to search for clothing and video game brand joint to deal with old operation concepts and low technology. Thirdly, the interaction is proposed to enhance the consumer experience through personalization and Metaverse. At last, individuality is proposed to integrate multiculturalism to show uniqueness and strengthen information construction for modern technology. To validate the performance of the proposed methodology, a questionnaire on 508 samples from 3 time periods is analyzed based on SPSS26.0. The statistical methods are performed to answer the proposed research questions. The results show that the characteristics and experience are the most concern among consumers and the main channel for broadcasting products is the display which gives new direction for product exposure with the help of brand joint. The Validity test is also taken into consideration based on KMO and Butlet test, the results show that the questionnaire is suitable for analysis. Finally, the Exploration Factor Analysis is conducted through rotation analysis, the results show that consumers are not satisfied with the current uniqueness and experience which proves that the proposed method is beneficial for product improvement.

5.2 Discussion

The design of the MCCP is carried out from the perspective of homogeneity, old operation concepts, and low technology. The 4i theory proposes a new design concept from four angles. The following three solutions are proposed for the above three problems.

(1) Homogeneity: 1) Strengthen the graphic visual creative design of cultural products to enhance the graphic art visual effects of the cultural products of the museum. 2) Strengthen the personalized and innovative design of consumers of cultural products to meet the market demand for consumers' personalized design and development of cultural products. 3) Strengthen the fusion of multicultural elements.

(2) old operation concept: 1) Strengthen the brand joint between museums that have similar factors. 2) Strengthen the brand joint between the clothing industry. 3) Strengthen Cross-border brand joint.

(3) low technology: 1) Integrate modern craftsmanship, and meet the aesthetic needs of modern people. Develop advanced video games to realize brand joint. 2) Develop holographic imaging projection, and create the feelings of crossing time and space. 3) Strengthen information construction.

The analysis of the questionnaire illustrates that the novel design concept appeals to current consumers' intentions, which is meaningful for the design of MCCP.

5.3 Practical Implication of the Study

As for practical implication, during the design of MCCP, it is necessary to combine the actual situation of the museum itself and the local market, gradually formulate relevant development principles, and break through the museum's self-limitations. It should always maintain diversified thinking, break the traditional operation concept, and search for possible brand joints to enlarge the influence of the museum and its products. Meanwhile, some high technologies are necessary for improving consumers' experience.

5.4 Implication of the Theory

This paper first introduces the 4I theory into the design of MCCP. The 4I theory not only promotes the quality of products but also gives similar implications to other fields.

5.5 Recommendations and Suggestions for Further Studies

(1) The design of MCCP is further optimized to overcome the Homogeneity, old operation concept, and low technology. However, there are also some other drawbacks such as rough workmanship, short preservation time, etc. For future studies, comprehensive thinking about those drawbacks may further improve the design of products.

(2) The design and analysis of MCCP are limited to the consumer perspective, which is not fair. For further study, the design may be further optimized from the perspective of the museum itself and the geographical environment.

5.6 Conclusion

As a display form of a country, the MCCP has gradually begun to get people's attention. However, the design of the current MCCP has defects such as homogeneity, old operation concepts, and low technology, which seriously limits the broadcast of country culture. This paper proposes the design concept of improving the MCCP through the 4i theory. Interesting, Interests, Interaction, and Individuality aspects give constructive opinions on the design of the MCCP. Analysis of 508 questionnaires through SPSS26.0, from the structure of the questionnaire to the reliability and validity test indicates that the new design concept can meet the psychological needs of the current tourists.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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