



Digital Will Empower Macao and Promote International Cultural Exchanges and Mutual Learning

Jing Zhang and Sheng Nan Pang

EasyChair preprints are intended for rapid dissemination of research results and are integrated with the rest of EasyChair.

September 6, 2024

Digital Will Empower Macao and Promote International Cultural Exchanges and Mutual Learning

Abstract: With the evolution of the global political and economic pattern, the international promotion of city brands and non-governmental exchanges have become new issues and opportunities facing the world. In recent years, the Government of the Macao Special Administrative Region has actively strengthened the development of cultural tourism, digital technology, youth entrepreneurship, leisure, business and exhibition, aiming to highlight the process of industrial diversification in Macao. Macao, a dynamic and innovative city, not only has a rich historical and cultural heritage, but also enjoys unique geographical advantages and convenient transportation. Under the framework of "one country, two systems", Macao has not only retained traditional Chinese culture, but also actively integrated excellent international cultural elements, forming an open and inclusive cultural atmosphere, and enhancing its attractiveness and competitiveness in international cultural exchanges. In addition, the application of digital technology has played an important role in promoting the development of international culture in Macao, injecting new impetus into the global communication of Macao cultural brands. Through case analysis, this study discusses the key influence of digital technology in the building of international brands in Macao, and analyzes its main models, aiming to provide insights and reference for digital technology in promoting the development of international brands in Macao.

Key words: digital technology; Macao culture; regional culture; international vision; international brand

preface

The Macao Special Administrative Region, a bright pearl of Chinese and Western cultures, breeds a cultural landscape with unique features. This study explores how Macao can promote the effective protection and sustainable inheritance of cultural heritage with the help of its rich regional cultural resources and modern digital technology, so as to consolidate and enhance its status on the international cultural stage. This paper analyzes how Macao makes use of its geographical advantages and cultural diversity to build and promote cultural brands with regional characteristics, so as to promote the all-round development of society and the innovative vitality of culture.

International regional brand is a comprehensive concept, which involves the uniqueness of regional culture, the strategy of brand building, the expansibility of international influence and the dissemination of cultural value. In the context of globalization, deepening the construction of international and regional cultural brands is not only crucial to the protection and renewal of cultural heritage, but also a key factor to promote regional economic prosperity and enhance cultural competitiveness. Through the case analysis of the construction of Macao characteristic cultural brands, this paper reveals how to combine tradition and modernity, heritage and innovation, realize the in-depth development and international communication of regional cultural brands, and promote the coordinated growth of regional economy and culture.

1. The basic conditions for Macao to develop international and regional brands

(1) Rich and diverse cultural heritage

Only by looking back to the source of history can we understand the real world, and only by mutual learning among civilizations can we achieve common progress. The Government of the Macao Special Administrative Region has adopted a series of scientific and systematic policies and measures on cultural resources to ensure the authenticity and integrity of its cultural heritage. Highlights a strong commitment to non-renewable resources and a strong commitment to promote cultural diversity and sustainable development. Through fine management and innovative activation and utilization, cultural heritage has become the core

driving force of Macao's urban development.

In the long course of human history, all nations in the world have created civilizations with their own characteristics. Cultural heritage carries the splendid civilization and traditional history and culture, and is an important achievement of the diversified development of human civilization and a non-renewable and irreplaceable precious resource.

As a treasure house of cultural heritage, the Macao Special Administrative Region has rich and diverse cultural assets covering historical buildings, traditional art and festival activities. In particular, the historic city of Macao was awarded the UNESCO World Cultural Heritage status on July 15, 2005, which marks the important position of the region in the field of global cultural heritage protection^[1]. The historic city of Macao contains 25 crucial historical buildings and relics, which are not only the witnesses of Macao's history, but also the treasures of Chinese culture.

The historic city of Macao extends from south to north, from the ancient Ma Temple to the historic Fengshun Hall, this series of landmarks connect a cultural corridor full of historical heritage. Each landmark carries the profound historical memory of Macao and is a direct witness of Macao's profound history. As the oldest existing temple in Macao, it was first built in the first year of Emperor Hongzhi of the Ming Dynasty (1488), and has a history of more than 500 years. The architectural style and carving technology of the Temple fully show the unique charm and exquisite skills of ancient Chinese architecture, leaving a valuable legacy for future generations^[2].

The Government of the Macao Special Administrative Region attaches great importance to the protection and inheritance of cultural heritage, promotes the activation and utilization through policies, promotes the deep integration of culture and tourism, and enhances its international influence and competitiveness. The richness of these cultural heritages has significantly enhanced the cultural landscape of Macao, shaped it into a model of cities with distinctive cultural characteristics, and built a solid cultural foundation for the long-term prosperity of Macao's culture and the vigorous development of tourism.

With the acceleration of globalization and the increasingly prominent cultural diversity, Macao will continue to uphold the reverence of cultural heritage, deepen the protection and research of cultural heritage, and promote the deep integration of cultural heritage and modern society. By strengthening international cooperation and exchanges, Macao will further expand its international influence in the field of cultural heritage protection. To contribute its unique cultural strength to the construction of a community with a shared future for mankind, promote the coordinated development of the cultural industry and the tourism industry, and inject a steady stream of vitality into Macao's economic prosperity and social progress.

(2) The rapid development of the digital economy

The Macao SAR government is well aware of the importance of the digital economy for its future development and has adopted a number of policies to promote its innovation and development. This strategy not only focuses on the improvement of digital infrastructure, including big data and artificial intelligence, Internet of Things application, data center and cloud platform construction, and lays a solid physical and technical foundation for digital economy; The SAR Government attaches great importance to data security and privacy protection, and guarantees the healthy development of digital economy through the improvement of laws and regulations and the application of technical means.

1. The Macao SAR government leads the development of the digital economy: 5G, big data and artificial intelligence go hand in hand

Technology has built a solid foundation for the transformation of culture to industrialization, and its continuous progress has become the prerequisite factor for the formation of cultural industry, while the vigorous development of cultural industry directly reflects the trajectory of technological evolution. In the field of digital culture industry, technology plays a role as the core driving force, especially the deep integration and innovative

application of next-generation communication technologies with 5G as the core, big data analysis and other cutting-edge technologies such as artificial intelligence, which is leading a disruptive change in this field.

Big data, as the cornerstone resource of contemporary information technology, its huge data volume, diversified data types and high-speed processing efficiency have built an unprecedented data treasure house for artificial intelligence (AI) algorithms, and continuously provided nourishment for the evolution and optimization of AI algorithms. AI technology, with its excellent data processing and deep learning capabilities, has become the key key to unlock the potential value of big data. Quickly learn and optimize the model in massive data, and then maximize the mining and utilization of the value of big data. In this process, the deep integration of big data and artificial intelligence builds a dynamic, balanced and mutually promoting ecosystem, which not only accelerates the digital transformation and upgrading of traditional industries, but also injects new vitality into the sustainable development of the global economy and society.

In the field of building and optimizing digital infrastructure, the Macao SAR government has shown a forward-looking strategic vision and significantly increased investment and research and development in cutting-edge technologies such as 5G networks, big data centers and artificial intelligence. Through close cooperation with China Telecom (Macao) Co., LTD., Macao has successfully promoted the construction and operation of 5G network, and realized the leapfrog upgrade of network infrastructure. After obtaining the 5G operation license, China Telecom (Macao) Co., Ltd. has actively invested a lot of capital and resources to build a 5G network system covering a wide range of areas, providing more portable and efficient network services for Macao citizens and enterprises, and laying a solid foundation for diversified digital applications.

At the same time, the Government of the Macao SAR is also actively preparing for a cluster of big data centers to meet the rapidly growing demand for data storage and data processing. These big data centers show excellent data processing capabilities, and through the introduction of intelligent and green data concepts, they realize the organic combination of high efficiency and low carbon emissions. The establishment of the big data center has provided solid data support and computing resources for the development of Macao's digital economy, and further accelerated the pace of digital transformation in various industries^[3].

In terms of the application and development of AI technology, the Macao Special Administrative Region government has attached great importance to it, and through policy support and environmental creation, has actively introduced and cultivated AI enterprises and established AI industrial parks, building a high-quality platform for the vigorous development of the AI industry. In addition, the government also encourages universities and research institutions to deepen research in the field of AI, and cultivate more AI talents with innovative and practical capabilities, so as to provide a solid talent guarantee for the continuous prosperity of Macao's AI industry.

By increasing investment in and research and development of cutting-edge technologies such as 5G networks, big data centers and artificial intelligence, the Government of the Macao Special Administrative Region has not only modernized the network infrastructure, but also provided strong support for the diversified application and innovation of the digital economy. Looking into the future, with the continuous evolution and integration of digital technologies, the Government of Macao SAR will continue to lead the trend of digital reform and push Macao's digital economy towards a more prosperous and sustainable tomorrow.

1.1 Macao leads the new trend of digital economy: VR and AR technology enable the tourism industry to create a new chapter of immersive experience

With the wide application of digital technology, the cultural industry not only adopts the mode of digital platform agglomeration and communication service from the cultural content, but also further digitizes and virtualizes the physical industry resources, so as to provide the way of industrial integration and important technical support for the development of the cultural tourism industry. The integration of culture and scientific and technological means has become a new form of tourism, such as the digital form of traditional cultural

heritage, museums launch exhibition tourism with the help of scientific and technological means, and the real economy forms shopping tourism through digital innovation. Through the application of digital technology, the "new tourism scene" is created, and the scene reconstruction of cultural tourism resources and the platform integration services of the cultural tourism industry are realized[4].

Virtual reality (VR) and augmented reality (AR) technology, and even the meta-universe, are the digital presentation of life scenes, the upgrading of human information interaction ability, and even the intelligence of terminals. Under the bottleneck of the development of traditional tourism, scientific and technological innovation and digitalization provide a breakthrough point for realizing high-quality development, that is, to empower the culture and tourism industry with the help of digital technology. In the application of six scenarios, such as business exhibition, industrial production, real estate marketing, medical and health care, education and training, and entertainment and entertainment, the current application of smart tourism is mainly AR real scene tour and VR preview, which enrich the sightseeing methods of scenic spots and create an immersive interactive experience.

In the wave of digital economy model transformation, the Government of Macao Special Administrative Region actively introduces and integrates international cutting-edge technologies, especially virtual reality (VR) and augmented reality (AR), to deeply innovate the experience dimension and competitiveness of the tourism industry.

By carefully planning the "Virtual Venice Tour", it innovatively uses VR technology to build an immersive virtual Venice water city for tourists. This experience allows visitors to walk freely through the ancient streets and waterways of the Venetian people, stay in the real streets and lanes of Venice, enjoy the exquisite architectural details and artworks, and even interact with the virtual local residents to experience the unique charm of foreign culture. This seamless blend of virtual and reality greatly broadens the boundaries of traditional tourism experience and provides deep immersion.

The "Virtual Venetian Tour" not only satisfies the tourists' pursuit of novel experience, but also profoundly affects the tourists' cultural cognition and emotional connection to the Venetian Macau resort. Through VR experience, tourists can more intuitively feel the cultural heritage and unique charm of the resort, so as to establish a more profound and lasting emotional bond. The enhancement of this emotional connection not only helps to enhance the brand image and loyalty of the resort, but also lays a solid foundation for the expansion of the future tourism market.

The Macao SAR government, together with a leading international technology enterprise, has successfully introduced and deeply integrated augmented reality (AR) technology, and then developed a unique AR guide system. The system covers the iconic tourist landscape of Macao, covering the time-honored cultural landmark Ma Temple, the archway of SanBa with rich cultural heritage, and the Venetian resort of modern luxury, realizing a comprehensive innovation of the traditional and modern tourism experience[5].

The AR tour system fully excavates the core advantages of AR technology, and creates a real-time interactive and deeply immersive guide environment for visitors. Visitors only need to use smart phones or special AR wearable devices to seamlessly access to the system, instantly obtaining detailed introduction and interactive content of scenic spots, which greatly enhances the fun and educational value of the tour. In the Temple, AR technology enables visitors to intuitively witness the historical evolution of the temple, the digital reproduction of architectural features, and the vivid interpretation of the virtual narrator, together to weave a vivid historical and cultural picture scroll, allowing visitors to get an unprecedented sense of historical and cultural immersion. In the archway of San Sanba, AR technology, with its strong resilience ability, reproduces the original features of this historical site, leading tourists to pass through the time tunnel and experience the vicissitudes and glory of history at close range[6]. In the Venetian resort, the AR guide system skillfully integrates shopping, entertainment information and interactive game elements, creating a new experience space

integrating leisure, entertainment and exploration for tourists. This innovative strategy has significantly expanded the depth of tourists' tourism experience, and effectively strengthened the comprehensive attraction and market competitiveness of Macao's tourism industry, and realized the double leap between the quality of tourism experience and the industry competitiveness.

Through the successful introduction and application of AR technology, the Macao Special Administrative Region has not only led the pace of global tourism to digital transformation, but also set a model of the integration and innovation of tourism science and technology, and contributed valuable experience to the development of international tourism[7]. With the rapid growth of digital economy in Macao, the wide application of emerging digital technologies has injected strong new momentum into Macao's rise on the international stage, and shaped it into a benchmark to show China's digital charm and the international high-quality development level.

The Government of the Macao Special Administrative Region will continue to deepen policy exploration and innovation in the field of digital economy, devote itself to promoting the deep integration of digital economy and real economy, and inject more vitality and potential into Macao's long-term prosperity and sustainable development through the dual drive of technological innovation and industrial upgrading.

2. Policy support is unprecedented strong

Macao, a city that integrates profound historical accumulation and unique cultural features, provides abundant creative source and material for shaping regional cultural brands with international influence. Under the macro layout of regional development strategy, the Macao special administrative region closely relying on "2" planning blueprint and "1 + 4" moderate economic diversified development strategic framework, elaborate and implement the Macao special administrative region economic development plan (2024-2028), through precise ShiCe, stimulate the vitality of emerging industries, foster new engine and function of economic growth, deepen the transformation and upgrading of traditional advantage industries, consolidate and enhance its international influence[8].

The plan not only focuses on cultivating cultural creativity, exhibition trade, research and development of traditional Chinese medicine, modern financial and high-tech industry of diversified economic system, also stressed through policy guidance, resource allocation optimization and deepening international cooperation, promote the integration of industrial innovation and system development, build an open, innovative, high value-added economic structure. Macao is committed to transforming its rich historical and cultural resources into cultural soft power. Through the innovative development of the cultural industry, it will further enhance its unique charm as an international tourism and leisure center and cultural exchange platform, and contribute Macao wisdom and strength to the cultural and economic prosperity of the region and even the world.

(1) The Government of the Macao Special Administrative Region strongly promotes cultural exchanges: International music festivals and art festivals jointly build a new chapter of cultural prosperity

From the mid-16th century to the mid-17th century, Macao, as one of the most prosperous foreign economic and cultural transportation hubs in the Far East, played a window connecting China and the world under the relatively closed historical background of China, and was also an important bridge for cultural exchanges between the East and the West. During this period, the advanced western mathematics, astronomy, as well as painting, music and other art forms were introduced to the land of China through Macao, promoting the cultural exchange and integration. Therefore, Macao has accumulated rich historical and cultural heritage, and relatively completely preserved the traditional essence of Chinese culture.

The Government of the Macao Special Administrative Region is committed to deepening and promoting cultural exchanges, and the Macao International Music Festival and Art Festival, as two iconic cultural brands, jointly lead a new chapter of Macao's cultural prosperity. These two brands fully show the rich cultural and artistic heritage of Macao, and have become the core force of building an international brand of Macao's cultural

industry.

Macau International Music Festival, as a stage for the integration and innovation of Chinese and Western music and art, gathers the world's top music power. The annual event integrates the essence and modern innovation, offering a feast of music and art for the audience. Its unique artistic presentation highlights Macao's respect for music art and its open and inclusive cultural attitude, and further strengthens Macao's position as a "cultural exchange center"[9].

The Macau Art Festival fully shows the diversity of art, spanning the diverse fields of drama, opera, dance, acrobatics, music and visual art, and promotes in-depth dialogue and mutual learning between local and international art through art exhibition from an international perspective. The Macau Art Festival highlights the creativity of artists, but also attracts international artists to participate in the event, strengthens the bond between Macao and international cultural exchanges, and promotes the prosperity and development of global cultural diversity[10].

Both the Macau International Music Festival and the Macau Art Festival adhere to the cultural concept of "integration of Chinese and Western cultures", accurately fit the historical background and the trend of international exchanges in Macao, and highlight the charm of cultural integration in the tide of globalization[11]. They are not only the window of cultural exchange, but also the promotion of Macao's international cultural image and influence, injecting inexhaustible impetus into the vigorous development of Macao's cultural industry.

The high support of the Macao SAR government and the wide recognition of the international community have jointly forged the brilliance of these two cultural brands. With the continuous prosperity of Macao's cultural industry, Macao's position in the global cultural exchange map will be more stable, continue to enhance its international influence and attraction, and open up a broader prospect for the vigorous development of Macao's cultural undertakings[12].

(2) Macao's policy guidance: Integrate into the "Belt and Road Initiative" and build a new pattern of economic integration in the Greater Bay Area

The "Belt and Road" originated from China and belongs to the world. As one of the special administrative regions, Macao makes full use of the institutional advantages of "one country, two systems", unique geographical advantages and rich network resources of returned overseas Chinese and their relatives, actively participates in and contributes to the construction of "Belt and Road", builds a long-term cooperation mechanism, and seamlessly connects the strategy of "one center" and "one platform" and the "Belt and Road" initiative.

The Arrangement on Supporting Macao's Full Participation and Assistance to the Belt and Road Construction issued by the Policy Research and Regional Development Bureau of the Macao Special Administrative Region Government systematically plans the core tasks and strategies of Macao in the Belt and Road construction[13]. Through policy guidance, resource allocation and market mechanism activation, the SAR government will build a bridge connecting the countries along the Belt and Road routes, strengthen top-level design, and encourage all sectors of society to give full play to their creativity, seize the opportunities of The Times, and actively participate in international cooperation.

As the core hub of the Guangdong-Hong Kong-Macao Greater Bay Area, Macao plays a major role in the "Belt and Road" initiative. Relying on its position as a regional transportation hub, Macao effectively alleviates the risk of economic fluctuations and promotes the process of regional economic integration. Taking advantage of its unique geographical and cultural background, Macao has deeply integrated into the economic and trade activities of countries along the Belt and Road, relying on its mature financial system to promote the trade circulation of many countries, and provide solid financial support for the "Belt and Road" project.

Macao has a sound land, sea and air transport network, including infrastructure such as the Macao International Airport and the Hong Kong-Zhuhai-Macao Bridge, providing solid support for the transport integration of the Guangdong-Hong Kong-Macao Greater Bay Area. As a regional transportation hub, Macao not

only promotes the flow of people, education and cultural exchanges, but also alleviates structural problems such as resource tension and prominent class conflicts within Hong Kong and Macao communities through regional cooperation, and promotes social harmony and stability in Hong Kong and Macao. With the completion of the Hengqin Line of Macao light rail, Macao has further integrated into the one-hour living circle of the Guangdong-Hong Kong-Macao Greater Bay Area, accelerated the convenient flow of people, logistics and information, strengthened the economic synergies within the Greater Bay Area, and formed a closer economic cooperation network.

As an important node under the Belt and Road initiative, Macao actively promotes cooperation with Portugal in trade, investment and tourism. Macao financial institutions have provided customized financing support for Portuguese enterprises, effectively helping them to take root and expand their business in the vast Chinese market. The Government of the Macao Special Administrative Region has also frequently organized economic and trade delegations to visit Portugal to enhance bilateral exchanges and cooperation opportunities, jointly explore new areas of cooperation, and contribute to the deepening implementation of the Belt and Road initiative[14].

Through its comprehensive integration into the Belt and Road initiative and the economic integration of the Greater Bay Area, Macao has not only promoted its own economic and social prosperity, but also highlighted the new height of cultural diversity and regional cooperation, making a positive contribution to global economic cooperation, prosperity and stability.

3. Digital empowerment is the main model of Macao's international development

In the 21st century, human society is faced with increasing complex challenges, requiring global cooperation to explore new drivers for economic and social development. In this context, the "Belt and Road" initiative emerged at the historic moment, conforming to the historical trend of the new technological revolution, and closely aligned with the global digital wave, opening up a new development opportunity for international cooperation. Digitization is not only the core path for the in-depth implementation of the Belt and Road initiative, but also a direct demonstration of the achievements of the new technological revolution, forming the core driving force under the new paradigm of globalization.

Cutting-edge digital technologies such as cloud computing, the Internet of Things, big data, artificial intelligence, blockchain and virtual reality, as new engines to promote international and regional cooperation and development, have significantly enhanced their global confidence and determination in digital transformation. In the context of globalization and digitalization, digital platforms are gradually building an infrastructure framework to support the future pattern of globalization.

The construction and extensive application of the digital platform have promoted the deep cultural exchanges and interactions between China and people from the rest of the world, greatly enriched the connotation of cultural diversity, and accelerated the global dissemination and sharing of cultural content. As a key bridge and window for China connecting the international community, Macao is actively integrating into and deepening international cooperation in the field of digitalization. Further strengthen the coordinated development of the regional economy through digital means, and promote the global influence and communication power of Chinese culture to continue to rise.

(1) Macau Digital Arts Future Exhibition: Digital art integrates multi-dimensional power and explores infinite creativity

With the rapid development of digital technology, the evolution of digital new media presents an ever-changing trend. This field not only greatly expands the form of entertainment and information access channels, but also deeply touches and reshaped the appearance of the traditional culture and art field. In the process of multi-dimensional integration, digital art, as an emerging art form, has built a diversified digital display platform for art works by virtue of its unique media characteristics and technological innovation.

The Future Exhibition of Macau Digital Arts, planned by the graduate team of Macau University of Science and Technology, takes the "MUSTSUM Digital Art" as the core concept, and deeply discusses the multi-dimensional integration power of design, technology, commerce, users and culture. Through a unique perspective of digital art, the exhibition integrates neural network style migration algorithms, AI path planning strategies and 2.5D manufacturing technology. While excavating and broadening the boundaries of digital creativity, and enhancing the economic value of related industries, we should also not forget to strengthen the humanistic care and emotional resonance, and create a series of creative digital art works.

These works not only depict Macao's urban style, history, culture and social development, but also show the new appearance and evolution trend of art in the digital era under the development background of the Guangdong-Hong Kong-Macao Greater Bay Area. Through the deep integration of art and technology, and the combination of innovative thinking and design aesthetics, the exhibition breeds a number of intelligent creation software based on stylized algorithms, and has generated more than 60 digital art works in batches. These works not only fully show the diverse features of Macao city, but also provide a rich creative inspiration and imagination space for the long-term planning of digital city construction.

The "Digital Art Future" exhibition, in cooperation with the National Ecological Industry Design and Research Institute and other institutions, has launched dozens of NFT (non-homogenized tokens) digital collections. These collections break the limitations of the physical form of traditional art works, and are presented in a digital form, bringing brand-new artistic experiences and feelings to the audience. Through the application of NFT technology, it not only expands the channels for the display and dissemination of art works, but also builds a more convenient and safe platform for art trading and collection, providing a new interactive mode for artists and collectors.

The successful holding of the Macau Digital Arts Future Exhibition has not only built a valuable platform for international artists to exchange ideas and share experiences, but also promoted the in-depth development of theoretical exploration and practical innovation in the field of digital art. It marks that Macao has set up a unique and distinct image on the global cultural map, effectively enhanced Macao's international visibility and cultural soft power, and injected new vitality and impetus into the future development in the field of digital art.

(2) Application of digital technology in industrial technology innovation: "tangerine peel X" project in Macao

The wind and waves will sometimes, straight sail to the sea. In the current revolutionary wave of industrial technology, this spirit has been endowed with a new connotation of The Times. Through the extensive application of digital intelligence technology, accelerate the transformation and upgrading of traditional industries, realize the optimization and upgrading of economic structure, and then promote the comprehensive and high-quality development of social economy.

As the master of the new generation of information technology, digital intelligence technology is penetrating into all links of traditional industries with the pace of rapid development, from the optimization of production process, the innovation of product design, the accurate prediction of market demand to the efficient coordination of supply chain management, enabling traditional industries in an all-round way. Through big data analysis, enterprises can deeply tap the market potential, gain insight into consumer behavior patterns, and provide data support for product customization and service personalization; the combination of cloud computing and edge computing builds a flexible and expanding IT infrastructure for enterprises, and improves the business response speed; the introduction of artificial intelligence realizes the intelligent and automatic production process, and significantly improves the production efficiency and product quality.

In the fierce competition of the 2021 Macau Youth Creative and Innovation Competition, the "State Key Laboratory of Traditional Chinese Medicine Quality Research", jointly developed by Macau University of Science and Technology and "Institute of Blockchain Application", stood out with its excellent innovative design

concept and remarkable practical value. The project focuses on —— tangerine peel, a treasure of traditional Chinese medicine. By integrating cutting-edge detection technology and big data analysis strategy, the precision and high efficiency of quality control in the whole life cycle of tangerine peel from planting to consumption are realized.

The project team made full use of the Internet and the new media platform, carefully planned and constructed the digital brand system of tangerine peel, which effectively expanded the market radiation range and brand awareness of tangerine peel. Relying on the Internet of Things technology, the "tangerine peel X" project builds a comprehensive digital management platform that runs through the upstream and downstream of the tangerine peel industry chain. The platform deeply integrates multiple production scheduling, service optimization, safety supervision and other functional modules, realizing the seamless docking and whole-process digital supervision from the field to the terminal market. Through real-time data collection and in-depth analysis, the project team can accurately adjust the parameters of the production process, and significantly improve the quality and yield of tangerine peel. At the same time, the platform also provides diversified information services including market dynamic analysis and consumer preference feedback, which lays a solid information foundation and decision support for the sustainable development of tangerine peel industry.

The successful implementation of "tangerine peel X" project not only marks a solid step for Macao's traditional tangerine peel industry to achieve modernization and internationalization, but also sets an example of innovation and entrepreneurship for Macao youth groups, and stimulates their enthusiasm for in-depth exploration and inheritance of local cultural resources. In addition, the project also promotes the optimization and upgrading of the industrial structure of Traditional Chinese medicine in Macao, provides an important window for international capital to understand the new growth points of Macao's economy, and further enhances Macao's international competitiveness and influence. In the background of the booming global market of traditional Chinese medicine, the implementation of "tangerine peel X" project has strongly promoted the continuous growth of the export volume of tangerine peel, and injected strong impetus for the expansion and deep cultivation of Macao tangerine peel industry in the global scope.

(3) Innovation of digital entertainment platform: the construction and influence of the Macau universe world

In today's rapidly changing technology ecosystem, the integration of digital platforms has become a transformative force leading the industry transformation, profoundly reshaping the operation mode and boundaries of the world. These platforms stand at the top of the wave of innovation, providing unprecedented insight, significantly improved operational efficiency, and deep optimization capabilities by building a precise mapping bridge between the physical world and the digital world.

In the field of digital entertainment, with the in-depth application of digital technology, entertainment platforms and entertainment platforms have built a highly immersive and interactive meta-cosmic world with the help of digital technology. On these platforms, users experience entertainment content like the physical world, such as participating in virtual concerts, exploring virtual parks, and even building deep emotional connections with virtual characters. This innovation not only greatly enriches the forms of entertainment, but also enhances the level and depth of the user experience. The construction of digital technology and the meta-universe are jointly drawing a blueprint for the future, leading us towards a more colorful new digital era full of challenges and opportunities.

The construction of the platform marks the profound digital exploration and remodeling of the profound historical and cultural deposits and unique urban features of Macao. The platform skillfully integrates entertainment, education, tourism and other elements. With the help of cutting-edge technologies such as virtual reality (VR) and augmented reality (AR), the platform creates a full-sensory and immersive digital experience space for users. In the Macau universe world, users can freely shuttle between the historical streets, modern

shopping halls and cultural landmark attractions of Macao, deeply immersed in and experience the multi-cultural charm and profound historical accumulation of Macao[15].

The highly interactive platform brings users an unprecedented sense of engagement and immersive experience. Users can not only deep interaction with all kinds of elements in the virtual environment, such as participating in historical event simulation, communicate with virtual characters, etc., can also on the platform and other users to establish close social contact, common exploration, share experience and insights, formed a novel and dynamic social interaction mode. This high interactivity and social nature of the world greatly enrich the experience level of users, making the Macao Universal World a comprehensive digital communication platform integrating cultural communication, educational enlightenment, leisure and entertainment.

The launch of the Macao universe platform has injected strong innovation vitality and infinite possibilities into the development of the city. It not only opens a unique window for the global audience, let people all over the world can find in a new way, perception and fall in love with Macao unique charm, also through digital means of Macao's cultural heritage, history, tourism resources and so on the systematic integration and vivid, effectively promote the modernization of Macao culture spread and international recognition, for the comprehensive sustainable development of the city laid a solid foundation[16].

(4) Digital leads the future: the innovation and application of intelligent digital people in Macao

Numbers drive change, and numbers create the future. As the core engine of the development of digital economy, technological innovation is a key force to promote industrial upgrading and transformation. In this context, Macao intelligent digital people, as an innovative model integrating cutting-edge technologies such as artificial intelligence, advanced computer graphics, high-precision speech synthesis technology and motion capture, highlight Macao's extraordinary achievements and outstanding strength in the field of scientific and technological innovation. This kind of intelligent digital person not only achieves a high degree of fidelity in appearance, but also realizes accurate simulation of human behavior in behavior mode and interactive response, bringing immersive interactive experience to users.

In the field of inheriting and carrying forward Macao's rich cultural heritage, Macao intelligent digital people, with its excellent computer graphics technology, has realized the vivid simulation of Macao's historical architectural style and traditional handicraft technology. These intelligent entities not only become effective tools for the digital preservation and inheritance of precious cultural heritage, but also open up a new perspective and path for academic research and cultural exploration, promoting the in-depth development of knowledge production. As an emerging carrier of cultural exchange, intelligent digital people have greatly enriched the media forms and communication means of cultural inheritance, built a solid bridge for the international communication and global identity of Macao culture, and effectively promoted the mutual learning and resonance of culture.

Through highly accurate simulation and reproduction, Macao intelligent digital people successfully show the unique charm and profound heritage of Macao culture across the boundary of time and space to the global audience. It not only enhances the outside world's cognition and interest in Macao culture, but also significantly enhances Macao's status and influence in the international cultural map, laying a solid foundation for Macao to become an important platform for international cultural exchanges and cooperation.

4. Digital empowers Macao to boost the international development of the city

With the rapid development and wide application of digital technology, Macao has gradually created its unique brand positioning on the international stage with its multicultural resources and its strategic geographical position at the core of the Asia-Pacific region, showing its significantly enhanced international influence. The acceleration of this process highlights digital technology as a pioneer of the change of The Times, providing opportunities and opportunities for Macao to transform into an emerging industry.

The enabling benefits of digital technology are remarkable, which has not only injected strong impetus into

the comprehensive development of Macao's economy and society, but also become a key force to promote its internationalization process. Through the deep integration of cutting-edge technologies of big data, cloud computing, artificial intelligence and other technologies, Macao has made an innovative leap in many key areas such as cultural inheritance, tourism promotion and business cooperation, and built a more efficient, intelligent, open and inclusive development system. At the same time, by incubating new business forms of international competitiveness, Macao has injected new impetus into its economic growth, diversified its economic structure, enhanced its economic resilience, and laid the foundation for sustainable development.

(1) Use digital technology to strengthen the position of "Belt and Road" hub

In the contemporary society where globalization and information technology are intertwined, the comprehensive penetration and in-depth application of digital technology has become the key point to drive the urban transformation, upgrading and prosperity and development. Macao, a city with rich multicultural deposits, has successfully built a set of efficient information capture and analysis system through the deep integration of cutting-edge digital technologies, to accurately grasp the international market dynamics and the pulse of demand. This ability has special value for attracting foreign investment inflow, expanding the international trade map, and stimulating the endogenous impetus of economic growth.

Under the grand blueprint of the "Belt and Road" initiative, As a natural bridge for cultural exchanges and economic cooperation, Macao has not only consolidated its pivotal position in the international trade network, but also actively expanded economic and trade exchanges and cultural exchanges between countries along the Belt and Road[17]. Through clever use of digital technology, the government of the Macao special administrative region and enterprises hand in hand to build a series of digital platform, the platform as an international business online communication new position, effectively improve the trading efficiency, significantly reduce the business operating costs, greatly promote the digital transformation and upgrading of economic and trade activities, to enhance the Macao competitiveness and influence in the global market.

Macao's exploration and practice in the field of digital technology application has strengthened its keen perception of the international market and further highlighted its key position as a global trade center. With the continuous deepening and expansion of the "Belt and Road" initiative, Macao will deeply integrate digital technologies, build a more open, inclusive and collaborative digital ecosystem, build a more solid bridge for economic and cultural exchanges and cooperation between China and the world, and make an important contribution to the inclusive growth and sustainable development of the global economy[18].

(2) Strengthen the global attraction of Macao as a global multicultural center with the help of digital channels

In the current wave of digitalization sweeping the world, we are in a situation of rapidly changing information and increasingly fragmented culture. This phenomenon profoundly reveals that the cultural ecology is stepping into a diversified track. Among them, digital technology, as a key driving force, has opened up a new path for the prosperity of cultural diversity.

As a unique city integrating eastern and Western cultures, Macao's rich cultural heritage and historical deposits constitute the image of its multi-cultural center. In the face of the opportunities and challenges in the digital era, Macao has actively embraced changes and made full use of new digital media such as social media and online tourism platforms as an important window for cultural output to show its unique cultural charm to the global audience. With their high degree of interactivity and immediacy, these digital platforms not only build a seamless bridge of communication between Macao and international tourists, but also strengthen the tourists' understanding and emotional resonance of Macao's cultural connotation.

This cultural promotion strategy based on digital channels has effectively enhanced Macao's popularity and attraction in the world, and further consolidated its position as a global multicultural center. In the future, Macao should continue to deepen the exploration and application of digital channels, constantly innovate the mode and

means of cultural communication, and promote its cultural brand to become a global multi-cultural center with more diversified and personalized interactive experience, so as to realize global communication and sustainable development.

(3) Build the key points of international brand building led by digital technology

Brand acts as a symbol, commitment, attitude, and even a symbol of the ecosystem. With the continuous evolution of science and technology, it has entered an ABCDE era with artificial intelligence (AI), blockchain (Block Chain), cloud computing (Cloud), big data (Data Tech) and e-commerce (E-Commerce) as the core elements. These technologies have not only profoundly changed the business landscape, but also provided significant opportunities for the international development of the Macao brand. Worldwide, many brands through depth fusion these cutting-edge technology, successfully created a new height of brand development, such as AI Chat GPT leading intelligent dialogue revolution, block chain empowerment can wal-mart black pork supply chain transparency, Google cloud services reveal computer power, amazon Dynamo database with big data to optimize customer experience, all is the model of digital technology can assign brand transformation and upgrading.

Macao international brands actively respond to this trend, providing user experience and interaction through deep integration of AI technology, using the transparency and immutability of blockchain to build a brand trust mechanism, and realizing precision marketing and strategy optimization with the help of the powerful processing power of cloud computing and big data technology. While building international brands, we should draw lessons from successful cases at home and abroad, build e-commerce platforms and social media marketing strategies with local characteristics, expand brand communication channels, and explore new scenario-based retail models, so as to provide unique brand experience for global audiences.

On the journey of building an international brand image, Macao unwaveringly takes digital technology as the core driving force, leads the continuous evolution of technological innovation and model innovation, is committed to deepening the brand value in multiple dimensions, and realizes the sublimation and expansion of Macao in the international brand region. By accurately capturing the pulse of market demand and consumption trends, Macao skillfully integrates big data, cloud computing, artificial intelligence and other cutting-edge technologies to strengthen the deep connection between the brand and consumers, and thus enhance the recognition and reputation of the brand in the market. At the same time, Macao deeply explores the intersection of tradition and modern, local and global culture, skillfully integrates the unique cultural essence and local characteristics into the brand construction, endows the brand with more profound cultural connotation and emotional resonance, so as to create a unique brand image in the global market.

Epilogue

In its report, the WTO predicted that by 2030, the widespread application of digital technology is expected to lead to a significant 34% growth in global trade, a transformative force that will profoundly reshape the structure of global value chains and disrupt and optimize the traditional operation mode of world trade[19]. In this context, the Overall Plan for the Construction of Hengqin Guangdong-Hong Kong-Macao Deep Cooperation Zone has established the construction goal of the Sino-Portugal International Trade Center and the digital trade international hub port, aiming to accelerate the transformation of traditional trade forms to the digital and intelligent direction through policy guidance and resource allocation[20].

The plan not only responds to the trend of The Times in the development of global digital trade, but also is a strategic deployment for deepening economic and trade cooperation between China and Portuguese-speaking countries and expanding new space for international trade under the Belt and Road initiative. By building an efficient and convenient digital trade platform, promoting the free flow and optimal allocation of goods, services, capital, technology and other factors, the Hengqin Guangdong-Hong Kong-Macao Deep Cooperation Zone is

expected to become a key node to promote the innovation of global trade model and lead the formulation of international trade rules in the era of digital economy. This move will also create more international trade opportunities for enterprises in the region, enhance their international competitiveness, and contribute to the high-quality development of China's economy and the prosperity and stability of the global trading system.

In the academic exploration of digital enabling Macao and promoting international cultural exchanges and mutual learning, we have deeply analyzed how digital technology can overcome the space-time barriers of traditional communication modes, and seamlessly connect Macao, a splendid city with the essence of eastern and Western cultures, into the vast network of global culture. As a shining example of "one country, two systems" policy practice, Macao with forward-looking strategic perspective, make full use of digital technology innovation power, not only accurate guardian and activate local rich cultural heritage, more on the digital platform in the form of innovation, realize the depth of cultural exchanges and mutual learning, in the global cultural stage blossom a unique and far-reaching cultural light and influence.

Digital has enabled Macao to vigorously promote the new process of international cultural exchanges and mutual learning with a vigorous momentum. Digital technology breaks through the barriers of traditional cultural exchange, builds a cultural bridge across time and space, and promotes the sharing and mutual learning of global cultural resources.

reference documentation

Lin Faqin, Li Jiahui. Macao's cultural industry policy: current situation, problems and system innovation [J]. Fujian Forum (Humanities and Social Sciences edition), 2022 (06): 28-38.

HongShuYing. Macau temple architecture age examination [J]. Shanxi Architecture, 2019,45 (10): 17-18.

He Y, Tan F, Leong C, et al. Realizing innovation and sustainability: A case study of Macau SAR's smart city development capabilities [J]. Journal of Urban Affairs, 2023(6): 1-19.

Wang Lingxi. The Guangdong-Hong Kong-Macao Greater Bay Area occupies the "new track" of the digital economy [N]. People's Daily Overseas edition, 2023-December 22 (004).

Liu M T, Liu Y, Mo Z, et al. Using text mining to track changes in travel destination image: the case of Macau [J]. Asia Pacific Journal of Marketing and Logistics, 2021, 33(2): 371-393.

Yu-jing zhang. On the reconstruction of the ruins of St. Paul's Church in Macau [J]. Interior Design and Decoration, 2024 (07): 119-121.

Li Zhen. Treasure hunting, reproduction and drama experiment: Virtual reality technology and its application in Macao community aesthetic education [J]. Journal of Tianjin Academy of Fine Arts, 2024 (01): 95-98.

Tian Jing, Tian Jingwen. Enrich the cultural and tourism experience with art events to establish more iconic performance brands [N]. 21st Century Business Herald, 2024-04-17 (009).

Xia-xia wang. Review of music studies in Macau on the 20th anniversary of China [J]. Yuefu

Xinsheng (Journal of Shenyang Conservatory of Music), 2020,38 (01): 110-115.

McCartney G, Ip Si Kei D. Art festival attendance: Who attends and why with implications on developing future festival attractiveness[J]. Journal of Convention & Event Tourism, 2018, 19(3): 268-285.

Chen Z, King B, Suntikul W. Co-creation of value for cultural festivals: Behind the scenes in Macau[J]. Tourism Recreation Research, 2020, 45(4): 430-444.

Sheng force. Macao's economic development after the regression: Achievements, experiences and prospects [J]. People's Forum, 2020 (01): 58-63.

Lou Shenghua. Review and foresight: The Reform of Public Administration in Macao SAR [J]. Hong Kong and Macao Research, 2020 (01): 48-56 + 94-95.

Li hongjie. Research on evaluation and path selection of Macao economy [J]. Asia-Pacific economy, 2020 (01): 127-136.

Chi-hua zhou. Research on exhibition space design based on the concept of meta-universe —— Take the Macau Exhibition as an example [J]. Urban Building Space, 2023,30 (S2): 141-143.

Guo Yu, Li Cui, Huang Guanghui. Visual reconstruction under sensory immersion: Take the design practice of the cultural and tourism universe in Macao as an example [J]. Furniture and Interior Decoration, 2023,30 (10): 58-63.

Luo zhichang. Exploring the opportunity and development strategies of "Belt and Road" Macao [J]. International Engineering and Labor Service, 2024 (05): 22-27.

Berlie J A, Hung S. The greater Bay area and the role of Hong Kong and Macau SARs in the Belt and road initiative[J]. China's globalization and the Belt and road initiative, 2020: 77-100.

Anderson K, Strutt A. The changing geography of world trade: Projections to 2030[J]. Journal of Asian Economics, 2012, 23(4): 303-323.

He Lifeng. Deepening cooperation between Guangdong, Hong Kong and Macao to promote the development of the Greater Bay Area [J]. China Science and Technology Awards, 2021 (07): 6-9.