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The Innovative Application of Internet of Things Technology in the Cultural Inheritance and Industrial Development of Phoenix Dancong tea

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Abstract: *As a treasure of Chinese oolong tea, Phoenix Dancong carries profound cultural heritage and unique production technology. However, in the process of cultural inheritance, it also faces many challenges, such as scattered production and small operation scale, insufficient brand awareness and market norms, single cultural communication channel and uneven technical management level. By analyzing the innovative application of Internet of Things technology in the whole chain of tea planting, tea processing, marketing, tea travel experience, etc., combined with the unique charm of Phoenix Dancong tea culture, this paper strives to provide comprehensive and in-depth strategic suggestions for the inheritance of tea culture and the intelligent upgrading of industry.*

Keywords: *Internet of Things technology; Phoenix Single Cluster; Cultural inheritance; Innovative applications*

1. Exploring the significance of the innovative application of IoT technology in the cultural inheritance and industrial development of Phoenix Dancong tea

Phoenix Dancong , also known as "Guangdong Narcissus", is famous for its unique aroma, taste and profound cultural heritage. It is a very precious national geographical indication product. It not only carries the essence of Chaozhou and even Chinese tea culture, but also is an important pillar of local economic development. However, with the rapid development of globalization and informatization, Phoenix Dancong is facing some problems in the inheritance of traditional tea culture and industrial development, such as scattered production, weak brand awareness and single cultural communication channel. Therefore, how to use Internet of Things technology to optimize the innovative application of Phoenix Dancong tea culture inheritance and industrial development has become an urgent problem to be solved.

The research aims to explore the innovative application of Internet of Things technology in the inheritance and industrial development of Phoenix Dancong tea culture. Through an overview of the existing Internet of Things technology and an analysis of the current status of inheritance and industrial development of Phoenix Dancong tea culture, as well as the innovative application of Internet of Things technology in the inheritance and industrial development of Phoenix Dancong tea culture, it aims to explore a new path suitable for the inheritance and industrial intelligent upgrading of Phoenix Dancong tea culture and verify its effectiveness in practice. It is helpful to provide new ideas and solutions for the innovative application of Internet of Things technology in the inheritance and industrial development of tea culture in Phoenix Dancong. It is expected to broaden cultural communication channels, enhance brand influence, and inject new vitality into the inheritance and industrial development of tea culture. Important progress has been made.

2. In-depth analysis of cultural inheritance and industrial development of Phoenix Dancong tea

2.1. Essence of Phoenix Dancong tea Culture

As a leader in oolong tea, Phoenix Dancong tea has won wide acclaim for its unique quality and cultural value, especially in Phoenix Town, Chaoan District, Chaozhou City, Guangdong Province. Its history can be traced back to the end of the Southern Song Dynasty (1278). According to legend, Emperor Bing of the Song Dynasty fled to Chaozhou in the south. When he passed through Wudong Mountain in

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Phoenix, he was thirsty. His attendants picked fresh tea leaves for the emperor to chew and quench his thirst. Later, he was named "Song Tea" and widely planted. In addition, there is a legend that "the phoenix bird heard that Emperor Song was thirsty and gave tea with a tea branch in his mouth", so it is also called "birds beak tea". Phoenix Dancong tea has a long-lasting fragrance after brewing and a unique natural orchid fragrance, so it is also known as the "perfume in tea". There are many varieties of tea. At present, there are more than 200 varieties, but they are usually summarized into ten flavor types, each of which has its own unique aroma and taste. The production process of Phoenix Dancong tea is complicated and delicate, including picking, drying, drying, greening, killing, rolling, baking and refining. Each step needs to strictly control the time and temperature to ensure the quality of tea. Its cultural value is also extremely rich. In Chaozhou, Phoenix Dancong tea is regarded as a symbol of auspiciousness and happiness, and every household will prepare a pot of good tea for distinguished guests. In addition, Phoenix Dancong tea is also one of the indispensable drinks in weddings, funerals and other occasions.

Overall, Phoenix Dancong tea is unique in the field of oolong tea with its long history, unique fragrant aroma, complex and delicate craftsmanship, and profound etiquette and hospitality carried in tea culture.

2.2. Current Situation and Challenges of Phoenix Dancong tea Industry Development

2.2.1. Development Status of Phoenix Dancong tea Industry

As the main producing area of Phoenix Dancong tea, the tea planting area in Chaozhou City has reached 276,900 mu by the end of 2023, accounting for 17.5% of the provinces total. According to the "Master Plan for the High-Quality Development of Phoenix Dancong tea Industry in Chaozhou City (2021-2025)", the goal is to develop the area of Phoenix Dancong tea Garden in the city to 250,000 mu by 2025. [1] And Phoenix Town for the Phoenix Dancong tea professional production town, its tea planting area of more than 4600hm2 , accounting for Chaozhou City, with a tea planting area of more than 4,600 hm2, accounting for about 32% of the tea planting area of 15,667 hm2 in Chaozhou City; The annual output is more than 7,500 tons, accounting for about 25% of the 30,100 tons of maocha output in Chaozhou. In addition to the continuous growth in planting area, the output of Phoenix Dancong tea is also increasing. In 2023, the tea output will reach 32,600 tons, accounting for 18.4% of the provinces total. [2]The marketing model of Phoenix Dancong tea is mainly composed of three offline channels: tea wholesale market, specialty stores and supermarkets. Affected by the epidemic situation in novel coronavirus pneumonia a few years ago, the market sales of tea have gradually moved to the Internet. With the help of e-commerce platforms, the proportion of online tea sales continues to increase, and sales in 2023 will increase by about 200% year-on-year.

The layout of Phoenix Dancong tea in the domestic market is becoming increasingly perfect, especially in Guangdong, Fujian, Zhejiang and other major tea consumption provinces, and the market share of Phoenix Dancong tea is increasing year by year. The rise of the new tea market has also brought new development opportunities for Phoenix Dancong tea. At present, more than 100 chain brands have launched a series of duck excrement drinks, further promoting the market consumption of Phoenix Dancong tea. Phoenix Dancong tea has won the favor of consumers with its unique aroma and taste, and its popularity in the international market has gradually increased, especially in Southeast Asia, Europe and America and other regions, and its export volume has increased year by year. Although Phoenix Dancong tea has a wide market layout and a surge in sales volume, intelligent planting and precision agriculture technologies have not yet been popularized, and the processing process lacks automation and intelligent upgrading, resulting in limited production efficiency and quality control. At the same time, the lack of product R&D and innovation capabilities makes it difficult to meet the diversified needs of the market, which limits brand competitiveness and international market expansion.

2.2.2. Phoenix Dancong tea Industry Faces Challenges

The degree of organization is low, and the driving force of the new main body is weak. Many tea farmers still adopt the traditional small workshop-style production mode, which is in a state of "small, scattered and weak". The planting area of each Phoenix Dancong tea garden is only a few mu, which is based on the historical "Zugong Mountain". There are few large-scale tea enterprises, and there is a lack of modern production equipment and technological processes, resulting in uneven product quality. Due to the scattered production, it is difficult to form economies of scale, resulting in high production costs and insufficient market competitiveness of Phoenix Single Cluster. At the same time, the lack of support of modern information technology, such as the application of blockchain in tea farmers cooperation and supply chain management, and the introduction of intelligent decision-making system, makes it difficult for tea farmers to organize effectively, and it is difficult for new subjects to play an efficient leading role.

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The town space is limited, and the pressure of future development is prominent. In recent years, Chaozhou tea industry planning has increased the supply side of tea industry, and Raoping Lingtou Phoenix Dancong tea has developed strongly. However, the space development of Phoenix Dancong tea Garden in Phoenix Town has basically reached saturation, and there is no more space for planting tea in mountains. At present, the tea planting area of Phoenix Town is 5533hm2, accounting for about 34% of the tea planting area of Chaozhou City, with a yield of 1.5 tons/hm2, and the yield per mu is lower than the average level of 1.875 tons/hm2 in Chaozhou City. In the case of limited land resources, remote sensing technology and GIS (Geographic Information System) have not been fully applied to optimize the spatial layout of tea gardens, and new technologies such as vertical agriculture have been explored to expand planting space or improve land use efficiency, which makes Phoenix Dancong tea industry face spatial bottleneck.(Table 1)

Table 1: Tea acreage and total production in Phoenix Township, 2019-2023

Annual	Phoenix Town		Chaozhou city	
	Actual area at the end of the year (MU)	Total output (Ton)	Actual area at the end of the year (MU)	Total output (Ton)
2023	83000	8300	241200	30100
2022	75000	7500	235000	28000
2021	73000	7200	225419	26728
2020	72000	7000	180909	22463
2019	65000	5500	165952	18402

Brand awareness needs to be strengthened and market norms need to be improved. [3] Phoenix Dancong tea is rich in resources and has advantages. The overall situation is that there are many manufacturers, small scale, serious redundant construction and waste of resources, which makes it difficult to achieve large-scale economic development, and the ability to adapt to the competitiveness of the market and resist risks is also poor, so it is difficult to form brand effect, and the situation of "famous tea but no famous brand" often appears. In the process of brand building, there is also a lack of application of big data and artificial intelligence in market research, consumer behavior analysis, etc., making it difficult to accurately locate market demand and build a brand with differentiated competitiveness. At the same time, the lack of application of blockchain technology in product traceability and anti-counterfeiting makes it difficult to build consumers trust and loyalty to brands.

Technical management more differences, tea quality to be improved. The farmers in charge of tea planting management in Fenghuang Town are mainly aged 45 to 65, and their education is mostly junior high school or below. These farmers in charge are not willing to accept new ideas and methods, and cannot make full use of modern technologies such as big data and Internet of Things to improve production efficiency and management level. In recent years, although many young people with higher academic qualifications have joined the tea planting management team, most of them have inherited the original tea planting management methods, and their management level in Phoenix Dancong tea Garden management, picking and processing, quality control, etc. needs to be improved. At the same time, in the process of tea garden management and tea processing, there is a lack of application of modern technologies such as Internet of Things and intelligent sensors in environmental monitoring, precise irrigation, intelligent picking, etc., which leads to extensive production management and difficulty in ensuring the stability and consistency of tea quality.

Cultural heritage bottleneck, brand innovation awareness is weak. Since the cultural dissemination of Phoenix Dancong tea mainly relies on traditional word of mouth and limited media publicity, this dissemination method is not only inefficient, but also difficult to reach a wider audience. At the same time, the interpretation and dissemination of tea culture lacks depth and breadth, and it is difficult to form a profound cultural heritage and extensive social recognition. And with the rapid development of digitalization today, the cultural communication of Phoenix Dancong tea fails to make full use of new technologies such as virtual reality (VR) and augmented reality (AR) to create an immersive tea culture experience scene and attract a wider audience. At the same time, the lack of digital platform and the integration of cultural and creative industries makes the spread of tea culture lack innovation and interaction. In terms of brand innovation, it also failed to make full use of big data to analyze consumer preferences and make accurate brand positioning and marketing strategy formulation.

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3. General application of IoT technology in tea gardens

The Internet of Things (IoT) refers to a network system that closely connects various physical devices, sensors, software and other technologies through the Internet to realize mutual communication and data exchange between devices. Its core is to deeply integrate objects in the real world with the digital world through intelligent and automated methods, thereby improving production efficiency, optimizing resource allocation, and improving user experience. The application scope of Internet of Things technology is extremely wide, covering industry, agriculture, medical care, transportation, smart cities and other fields.

Internet of Things technology can be combined with intelligent agricultural machinery equipment such as unmanned weeders and pickers, and through built-in sensors and control systems, it can independently complete farmland tasks, reduce labor costs, and improve weeding or irrigation efficiency. The Internet of Things technology can also be used to build the tea garden into an automated operation process, which can enable the tea garden to independently carry out automatic irrigation, fertilization, pruning, etc.

4. Internet of things technology in Phoenix Dancong tea cultural heritage in the construction of innovative strategies

4.1. Data-driven cultural heritage system

Big data technology is one of the important application technologies for the development of Internet of Things technology, and it is also the practice of big data concepts, technologies and methods in the agricultural field[4]. It is an important foundation for the development of modern agriculture, a new factor of agricultural growth in the new period, and one of the fundamental prerequisites for building smart agriculture[5].A report clearly puts forward the implementation of the national cultural digitalization strategy, emphasizing the need to improve the modern public cultural service system and innovatively implement cultural projects for the benefit of the people, so as to realize the effective inheritance and innovative development of culture.(*Figure 1*)

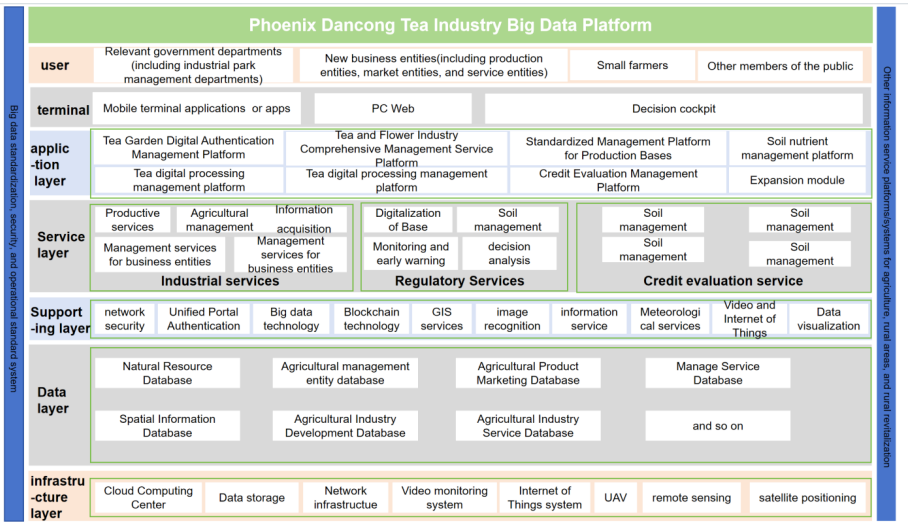

Figure 1: Constructing a big data platform for Phoenix Dancong tea industry based on Internet of Things (IoT) technology

Figure 1 shows that the big data platform of Phoenix Dancong tea Industry consists of seven levels: infrastructure layer, data layer, support layer, application layer, service layer, terminal and user. Among them, the purpose of the construction of infrastructure layer, data layer and support layer is to form the basic support of various functions of the big data platform, and undertake database construction, comprehensive data management and basic function support services; The service layer sets up functional modules related to the development, supervision and management of tea industry for government departments, business entities and the public; The application layer collects various functional modules to form a specific application platform for users; The terminal includes decision-making cockpit, PC Web and mobile terminal applications/applets, which are the specific carriers for visual display of various

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services and data; The user layer includes different groups such as the government, new business entities, small farmers and other members of the public. Through the back-end management of the support system, different groups can obtain different services on the platform. This design can not only gather the data resources of the tea industry chain, but also provide the basis for scientific management and accurate decision-making for tea farmers and tea enterprises, making tea production more in line with the essence of traditional skills; It can also record and disseminate the traditional production technology, historical origin and cultural connotation of Phoenix Dancong tea, enhance consumers awareness and interest in tea culture. Introducing the inheritance and development of tea culture provides scientific basis for the inheritance of Phoenix Dancong tea culture.

4.2. Digital Branding and International Communications

With the data support of the big data platform, the Internet of Things technology is used to realize the traceability of tea quality, help the internationalization process of Phoenix Dancong tea brand, and further deepen the inheritance of tea culture. First of all, using digital technology to collect, sort out, study and display Phoenix Dancong tea culture can make more people understand, appreciate and inherit these precious cultural heritages. At the same time, it provides technical support for the innovation of Phoenix Dancong tea culture, so that it can be better combined with modern life and glow with new vitality [6]. Secondly, with the help of the Internet, social media and other platforms, tea culture will be promoted to the whole country and even the whole world, making it a link of cultural exchange, enhancing understanding and friendship among all ethnic groups, and enhancing the popularity and influence of Phoenix Dancong tea culture. In addition, spreading Phoenix Dancong tea culture through digital means can effectively broaden its market channels, increase market share, promote industrial development, and realize both economic and social benefits of the traditional Phoenix Dancong tea industry. While inheriting and carrying forward the Phoenix Dancong tea culture, we will promote the development of related industries, create more jobs and help poverty alleviation accurately. Finally, the prosperity and development of Phoenix Dancong tea culture will also help to enhance the national cultural soft power, carry forward the excellent traditional Chinese culture, enhance national pride and cohesion, and promote PhoenixProvide assistance for the transformation and upgrading of Dancong tea culture industry.

4.3. Exploration of innovative models of tea-tourism integration

Phoenix tea area is the oldest tea area in Guangdong Province. Qianlongs Chaozhou Fuzhi records the tea production in Baihua Mountain, Fenghuang Mountain, Dapu Hemp and Yinna Mountain in Raoping. Generally speaking, the custom of growing and drinking tea in Chaozhou began in Ming Dynasty and flourished in Qing Dynasty, which shows that Fenghuang Dancong tea culture has a long history and rich cultural heritage. On this basis, combined with Internet of Things technology, a new model of Phoenix Dancong Smart Tea Travel will be created to enhance tourists immersive experience of tea culture. Through tourism, it shows the systematic characteristics of Phoenix Dancong tea culture, which combines tea culture, She culture and red culture. Integrate natural, cultural and red revolutionary resources such as Tianchi at the top of Wudong Mountain, Fengxiang Gorge Tourist Scenic Spot, traditional ancient architectural community of She ethnic group, Fenghuangshan Revolutionary

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Memorial Park, Huang Qiufu Martyrs Monument, etc. into a boutique route, and systematically build Fenghuangshan Tea Travel Corridor. Take literary travel, strengthen tea with travel, consolidate the foundation of intangible cultural heritage, and promote Chaozhou Phoenix Dancong tea Culture System to declare the important agricultural cultural heritage in the world.

5. Exploration of Innovative Application of Internet of Things Technology in Phoenix Dancong tea Industry

The Internet of Things, that is, "the Internet connected by things", is an extended and expanded network based on the Internet[7] . Its applications are very wide, covering many fields such as smart home, smart industry, smart finance and smart agriculture. Among the 2035 development goals put forward in the report of the 20th National Congress of the Communist Party of China, one of them is to realize agricultural modernization, and the full development and utilization of Internet of Things technology is an important channel to realize agricultural modernization[8] .

5.1. Exploration of the Application of Internet of Things Technology in Phoenix Single-Colony Tea Production and Tea Plantation Management

Table 2: Innovative application of IoT technology in Phoenix Dancong tea plantation

Innovative applications	Specific classification and introduction	
Environmental monitoring of tea plantations	Real-time data acquisition	The environmental data of Phoenix monoculture tea garden is collected in real time through various types of sensors deployed in Phoenix monoculture tea garden, such as temperature and humidity sensors, light sensors, soil moisture sensors, and so on. These data include, but are not limited to, key parameters such as air temperature, humidity, light intensity, soil moisture, soil pH, and so on.
	Remote monitoring and data analysis	The collected data is transmitted to the data center or cloud platform through the IoT network, and the managers can remotely view the environmental conditions of the Phoenix Dancong tea plantation through cell phones, computers and other terminal devices.
	Early warning and decision support	When the environmental parameters of the Phoenix Dancong tea plantation exceed the normal range, the system can automatically send out early warning messages to remind managers to take timely measures.
precision irrigation	Intelligent Irrigation System	Through the soil moisture sensor real-time monitoring of soil moisture, the system can automatically adjust the amount of irrigation according to the growth needs of tea trees and soil condition, to realize the Phoenix Dancong tea garden irrigation system intelligent.
	Water-fertilizer integration technology	Through the intelligent water-fertilizer machine, soluble solid or liquid fertilizers are mixed with water and then delivered to the roots of tea trees through pipes and drip heads in a timed and quantitative manner. This way can improve the utilization rate of fertilizer and reduce the impact on the environment.
Early warning of pests and diseases	Pest and disease monitoring networks	By deploying equipment such as pest and disease monitoring sensors and high-definition cameras in Phoenix monoculture tea gardens, it is possible to monitor the occurrence of tea pests and diseases in real time and control the spread of pests and diseases.
	Intelligent Identification and Early Warning	Using image recognition technology and big data analysis technology, the system is able to automatically identify the characteristics of pests and diseases on tea leaves and send out early warning messages.
	Integrated prevention and control strategies	Through the application of equipment such as solar-powered intelligent pest detectors and Internet of Things (IoT) insecticidal lamps, functions such as trapping, killing, collecting and distributing can be realized. At the same time, big data analysis technology is utilized to predict the occurrence trend and pattern of pests and diseases, providing scientific basis for the development of prevention and control strategies.

With the rapid development of the network, the application of Internet of Things (IoT) technology in

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the management of Phoenix monoculture tea plantation has achieved remarkable results, especially in environmental monitoring, precision irrigation, pest and disease early warning, etc., which has brought intelligent, efficient and refined management tools for Phoenix monoculture tea plantation. Specifically as follows(*Table 2*):

5.2. Application Exploration of Internet of Things Technology in Phoenix Dancong tea Processing

From Table 2, we have clearly understood the innovative applications of Phoenix Dancong in the fields of tea planting and tea garden management. These applications not only improve the management efficiency of tea gardens, but also ensure the high-quality growth environment of tea. However, the quality of tea depends not only on the planting process, but also on the processing process. Next, we will discuss in depth how Internet of Things technology can help the intelligent transformation of tea processing process, thereby further improving the quality of Phoenix Dancong tea.[9].

Real-time monitoring and intelligent control. The application of Internet of Things technology in tea processing is first reflected in real-time monitoring and intelligent regulation. Through various high-precision sensors deployed in the processing workshop, such as temperature and humidity sensors, light sensors and air quality monitors, the system can continuously collect key parameters of the processing environment. These data are then transmitted to the central processing system, and advanced data analysis algorithms are used for real-time analysis and comparison. Once environmental parameters are found to deviate from the preset optimal range, the system will automatically trigger regulation mechanisms, such as adjusting ventilation equipment to optimize air circulation and adjusting heating or cooling equipment to maintain appropriate temperature and humidity conditions. This intelligent control can not only greatly improve the stability of the processing environment, but also ensure that tea is processed in the most suitable environment, thus retaining its unique aroma and flavor. [10].

Precise Control and Process Optimization. In the traditional production process of Phoenix Dancong tea, key processes such as frying, rolling and drying have a profound impact on the quality of tea. The introduction of Internet of Things technology has enabled the control of these processes to achieve unprecedented accuracy. Through sensors installed on processing machinery, the system can monitor the physical state changes of tea in real time during processing, such as dynamic adjustment of moisture content and subtle changes of color. Based on these real-time data, the system can automatically adjust the parameters such as mechanical strength, speed and temperature, and realize the fine control of tea processing process. For example, in the frying stage, the system can intelligently adjust the temperature and stir-frying frequency of the wok according to the heating situation and color change of the tea leaves, so as to ensure that the tea leaves are heated evenly and achieve the best greening effect. This personalized process optimization not only improves the processing efficiency of tea, but also enables each batch of tea to maintain its unique quality style. [11].

Quality Traceability and Quality Assurance. In order to ensure the quality traceability of Phoenix Dancong tea, the Internet of Things technology has introduced advanced traceability technologies such as RFID tags and QR codes in the processing process. These traceability labels are fixed on tea packaging or raw material batches, and record the whole process information of tea from picking, processing to packaging, including key data such as processing time, place, operator name and equipment status. When tea enters the market, consumers can easily access this information by scanning the QR code or RFID tag on the packaging through their smart phones, so as to realize a comprehensive understanding of the "past lives" of tea. This transparent traceability system not only enhances consumers trust and satisfaction with products, but also establishes a good brand image for enterprises and enhances market competitiveness. At the same time, for possible quality problems, enterprises can quickly locate the source of the problems and take effective measures to rectify them to ensure the stability and reliability of tea quality.

Data Analysis and Decision Support. The Internet of Things platform also has powerful data analysis capabilities, which can deeply mine and utilize the massive processing data accumulated by enterprises. By comparing and analyzing the processing data of different batches of tea, the system can automatically identify the key factors affecting the quality of tea, such as processing time, temperature control, mechanical operation parameters, etc. These analysis results provide valuable decision support for enterprises, help them continuously optimize processing technology and formula, and improve product quality and consistency. In addition, data analysis can also help enterprises predict changes in market demand, rationally plan production plans and inventory management, reduce operating costs and improve operating efficiency. [12].

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5.3. Exploration of Internet of Things Technology in Marketing and Brand Building of Phoenix Dancong tea

At present, there are many and miscellaneous brands of Phoenix Dancong tea in the market. Through the data collected by the Internet of Things, big data analysis and integration can be carried out, and efforts can be concentrated on building a brand system. The brand comes from the production quality, is displayed in the logo packaging, and is formed in the market effect. Chaozhou Fenghuang Dancong tea producing area has good ecological conditions, mature planting technology and processing technology, which can create high-quality Fenghuang Dancong tea quality, but the logo packaging and market development of tea need to be led by leading enterprises with market ability. Paying attention to brand building, encouraging leading enterprises to strengthen brand awareness, enhancing brand added value and implementing brand strategy are the only ways to promote the development of Phoenix Dancong tea industry. With the help of the Internet of Things platform, we can also accurately locate target customer groups, push personalized marketing information, and improve marketing efficiency. In addition, the Internet of Things can also build a sales network that integrates online and offline, such as "online reservation, offline experience", "scanning code to receive coupons, offline consumption", etc. to broaden market channels and enhance brand influence. And use social media platforms (such as WeChat, Weibo, Tik Tok, etc.) to carry out community marketing, regularly publish tea knowledge, tea culture, brand stories and other content to establish emotional connections with consumers. At the same time, online interactive activities (such as lottery, Q&A, etc.) are carried out to enhance consumers sense of participation and stickiness. [13]

6. Optimization Path and Implementation Strategy of Internet of Things Technology in Phoenix Single-Colony Tea Cultural Inheritance and Industrial Development

6.1. Technology Innovation and Integrated Application

Science and technology are the primary productive forces, so it is necessary to strengthen the research of tea science in Phoenix Dancong and speed up the progress of tea technology, so as to increase the income of tea farmers and promote the development of tea industry. First of all, large-scale tea processing enterprises are introduced to Fenghuang Town, Chaozhou City, and the investment in science and technology is converted into funds, so as to promote the transformation of production technology and establish the production standards of pollution-free and green tea, so as to better promote excellent varieties and tea production technologies. Then, the Internet of Things technology is used to establish a big data platform, combined with the traditional processing technology and mechanized production of Phoenix Dancong in Chaozhou City, and integrated tea garden environmental data, production and processing data, market sales data, etc., so as to deeply mine and analyze the tea data of Phoenix Dancong, so as to accurately predict and control the tea yield and quality, thus promoting the deep integration of Internet of Things technology and other emerging technologies and improving the intelligent level of Phoenix Dancong tea industry. Then open up a new field of production, consumption and market of Phoenix Dancong tea, innovate the process from the appearance and internal quality of tea products, and develop different characteristics of Phoenix Dancong tea according to the hobbies of tea consumers in different regions of China. For example, consumers in the north prefer aroma, which can reduce the degree of greening and baking in the process. Consumers with heavy taste can increase the degree of greening and roasting, especially Phoenix Dancong, which is the charcoal baking method in recent years, is popular with consumers. Finally, according to the market demand, we continuously develop new products such as functional food, health products and tea beverages of Phoenix tea, efficiently develop and utilize Phoenix Dancong low-grade tea, open up diversified markets, and comprehensively promote the development of tea industry.

6.2. Policy guidance and standard formulation

Both the state and Guangdong Province pay special attention to the research of tea science. The tea industry in Fenghuang Town should support the intelligent development of tea industry with the help of the scientific and technological theories of relevant national and provincial departments, carry out technological upgrading, and make use of the strength of colleges and universities to carry out research on related topics, so as to put the theoretical knowledge consolidated by colleges and universities into production. In terms of policy guidance, the government should increase investment in science and technology, and set up a special fund to support the research and development and application of

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intelligent equipment, big data analysis and Internet of Things technology of tea enterprises, so as to improve the intelligence level of the whole chain of tea from planting to processing, and improve the production efficiency and product quality of Phoenix Dancong tea. At the same time, tea enterprises are encouraged to establish in-depth cooperative relations with universities and scientific research institutions, jointly promote technological innovation and achievement transformation of tea industry, and form a good ecology of integration of Industry-University-Research. In terms of formulating standards, the government needs to formulate strict tea production standards, tea garden management, picking technology, processing process and other links, so as to standardize industry behavior and ensure that the quality and characteristics of Phoenix Dancong tea can be inherited and carried forward. At the same time, crack down on fake and shoddy products, maintain market order, enhance brand awareness and reputation, and ensure the standardization of cultural heritage.

6.3. Talent development and cross-border cooperation

Talent is the first resource, and the fundamental source of national scientific and technological innovation lies in people. It is necessary to strengthen the talent training of Phoenix Dancong tea industry and promote cross-border cooperation in Industry-University-Research. The key to cultivating talents lies in education first. We should first build a multi-level and diversified education system, covering the whole process from basic education to higher education. Then, the government will take the lead in increasing support for professional education related to tea industry, encouraging colleges and universities to set up tea science, tea industry management and other majors, and cultivating high-quality talents with professional knowledge and skills. At the same time, strengthen vocational training and continuing education, and provide opportunities for existing employees to upgrade their skills and update their knowledge to meet the needs of the rapid development of tea industry. In terms of promoting cross-border cooperation in Industry-University-Research, an effective cooperation mechanism and platform should be established first, and then the government should guide tea enterprises, universities, scientific research institutions and other parties to strengthen communication and exchanges, so as to realize resource sharing and complementary advantages through joint research and joint construction of R&D centers. That is, strengthen the talent training of Phoenix Dancong tea industry, promote cross-border cooperation in Industry-University-Research, and promote the innovation and application of Internet of Things technology.

6.4. Sustainable Development and Cultural Heritage Pathways

As the core component of modern information technology, Internet of Things technology is gradually penetrating into traditional agriculture and cultural industries, opening up a new path for the sustainable development of Phoenix Dancong tea industry and the effective inheritance of tea culture. Through communication sensing technologies such as intelligent sensing, identification technology and ubiquitous computing of Internet of Things technology, key environmental data such as soil moisture, light intensity, temperature and rainfall can be accurately collected to provide scientific planting guidance for tea farmers. This not only helps to optimize the growth conditions of tea and improve the quality of tea, but also effectively reduces the losses caused by natural disasters and ensures the stable supply of tea. Secondly, the Internet of Things technology has also promoted the intelligent upgrading of the tea industry chain. From tea picking, processing, warehousing to sales, IoT technology runs through the whole process, improving production efficiency and reducing operating costs. For example, by using RFID technology to trace the source of tea, consumers can learn about the growing environment, picking time, processing technology and other detailed information of tea by scanning the QR code, which enhances their trust in products. At the same time, the intelligent warehousing management system can accurately control the temperature and humidity, ensure that the quality of tea is not affected, and further enhance the brand value. The Internet of Things not only helps the sustainable development of Phoenix Dancong tea, but also effectively inherits tea cultureTo the key role. By recording and displaying the historical origin, production technology and tasting method of Phoenix Dancong tea by digital means, the tea culture can be spread more widely and deeply. The application of virtual reality (VR), augmented reality (AR) and other technologies allows consumers to experience the entire process of tea planting, picking, and making immersively, deepening their understanding and recognition of tea culture.

7. Conclusions and outlook

The innovative application of Internet of Things technology not only provides technical support and

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guarantee for the development of Phoenix Dancong tea industry, but also plays an irreplaceable role in the inheritance of tea culture. It has promoted the intelligent upgrading of Phoenix Dancong tea industry chain, and realized informatization and intelligent management in all links from tea garden management, tea processing to warehousing and logistics, marketing, etc. Through digital means and innovative communication methods, Phoenix Dancong tea culture has been spread to the outside world more widely and deeply, which has enhanced peoples cognition and recognition of tea culture, and injected new vitality and impetus into the inheritance of tea culture.

With the vigorous development of social economy and the significant improvement of residents quality of life, the concept of diet consumption is undergoing a profound change from satisfying taste buds preferences to pursuing health values. In this form, "increasing the total amount, improving the quality, launching the brand, adapting to the market, standardizing management and cultivating talents" is the strategy of developing Fenghuang Dancong tea production in Fenghuang Town. It is necessary to fully develop the characteristic economy of Fenghuang Dancong famous tea, form a development pattern of tea seedling breeding, variety garden enrichment, planting and production, processing technology, scientific research and promotion, product sales and integration of art and culture, and establish an industrialized management mode of company + base + farmers, and develop in the direction of regionalization, specialization and commercialization. Intensify scientific research, make use of big data intelligent decision support system based on Internet of Things technology, tea traceability and anti-counterfeiting system based on blockchain, etc., give full play to the innovative application of science and technology in agriculture, increase market share, and promote the steady development of tea industry in Fenghuang Town, Chaozhou City.

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References

[1] Weng Shaoxin, Ke Qina. Research on the high-quality development of Dancong tea industry in Phoenix Town, Chaozhou[J]. Fujian Tea,2024,46(05):3-5.

[2] Ge Kai-Li, Fang Jia-Fan, Qiu Qi-Yuan. Research on the Development of Chaoshan Tea Culture under the Background of "Netflix Economy"--Taking "Chaoshan Phoenix Single-Colony Tea" as an Example[J]. Modern Marketing (Lower Decade),2022,(11):43-45.DOI:10.19932/j.cnki.22-1256/F.2022.11.043.

[3] Zhan Xiaoshan, Zhang Wanting. Development strategy of tea industry in Phoenix Town of Chaozhou City[J]. Fujian Tea,2021,43(07):9-11.

[4] Wang Maohua. Big data to contribute to agricultural modernization [J]. China Science and Technology Information , 2014(10):13.

[5] SUN Jiulin, LI Denghua, XU Shiwei, et al. Research on the development strategy of agricultural big data and informatization infrastructure[J]. China Engineering Science, 2021, 23(4):10-18.

[6] Wang Lei. Digital brand design and promotion of folk arts and crafts[J]. International Public Relations,2024,(02):113-115. DOI:10.16645/j.cnki.cn11-5281/c.2024.02.062.

[7] You Qingshan. Research on the development mode of smart agriculture in the field of internet of things[J]. China Agricultural Resources and Planning, 2023, 44(3): 57,88.

[8] Wenjuan Zhang, Huimin Shao, Liangyan Lu. Analysis of Research Hot Spots and Trends of Agricultural Internet of Things Based on CiteSpace[J/OL]. Anhui Agricultural Science,1-9[2024-08-06].http://kns.cnki.net/kcms/detail/34.1076.S.20240725.1814.002.html.

[9] Sun, Y., & Ortiz, J. (2024). An AI-Based System Utilizing IoT-Enabled Ambient Sensors and LLMs for Complex Activity Tracking[J]. Academic Journal of Science and Technology, 11(3), 277-281. DOI: https://doi.org/10.54097/dj2pt496

[10] Zhong, Z., and Li, X., Re-Visiting the Green Puzzle: The Effect of Eco-Positioning on Inertial Consumers[J]. Available at SSRN: http://dx.doi.org/10.2139/ssrn.4138686,2024.

[11] Zhong, K., Jiang, Z., Ma, K., & Angel, S. A file system for safely interacting with untrusted {USB}

ISSN 2522-3488 Vol. 8, Issue 5: 9-19, DOI: 10.25236/IJNDES.2024.080502

flash drives[C]. In 12th USENIX Workshop on Hot Topics in Storage and File Systems (HotStorage 20),2020.
[12] X Chen, K Li, T Song, J Guo; Few-shot name entity recognition on stackoverflow, arXiv preprint arXiv:2404.09405, 2024.
[13] Luo M, Du B, Zhang W, et al. (2023) Fleet Rebalancing for Expanding Shared e-Mobility Systems: A Multi-Agent Deep Reinforcement Learning Approach[C]. IEEE Transactions on Intelligent Transportation Systems,24(4):3868-3881. doi:10.1109/TITS.2022.3233422