

Research on milk powder production and sales management system based on Beidou positioning

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Abstract: Food safety is a major issue related to people's livelihood. In recent years, food safety incidents have emerged in China, and it is urgent to solve the problems in the field of food safety. Food safety traceability is an important means to ensure food safety. At present, BeiDou positioning system has not been widely used in food traceability, and the demand for dynamic food traceability has not been solved. To this end, the paper introduces the application of Beidou positioning technology to milk powder traceability supervision, combined with QR code scanning technology, to design a system that can be dynamically supervised. The product is based on the Beidou positioning system, which mainly includes a low-power Beidou positioning device terminal and a cloud server. The BeiDou locator attached to the bottom of the lid is the main device for all services to be realized, and the current location information of the device is obtained regularly when it is working. Combined with the two-dimensional code technology, it facilitates information entry and reading, and establishes a complete traceability supervision system, including an APP client, which facilitates users to inquire various information about the products. The information of traceability has openness and transparency, data immutability and traceability, so that consumers and food regulatory authorities can know all the information of milk powder from production to sales, and it is convenient to manage and monitor the whole process from production to sales, so that users can consume with confidence.

Keywords: Milk powder; Internet of things; Beidou positing system; Traceability system.

1. Project Overview

1.1. Project Background

China's economy is developing rapidly, the per capita wage level and other aspects of a larger replacement, resulting in a very important consumer power, and in the milk powder market has shown the rapid development of mid-range products, but the rapid development has also brought unstable factors to the "melamine incident" as the representative of the infant milk powder. The melamine incident has had a huge negative impact on the trust in the safety of domestic infant formula. Although Chinese dairy enterprises, the government and society have made continuous efforts, the trust in the safety of domestic infant formula has not yet been restored. According to the data released by the State Administration of Market Regulation, the passing rate of infant formula sampling in 2020 reached 99.89%, but China imported 335,000 tons of infant formula, due to frequent safety problems, people are very dependent on imported milk powder, and online shopping as a popular shopping method in cash society, because of better portability and cheaper than physical stores are very popular among consumers, and in recent years, there is a large number of domestic milk powder posing as "baby formula". In recent years, a large number of domestic milk powder posing as "foreign brands" has emerged frequently, and illegal businesses sell counterfeit goods for profit to generate safety and quality problems that are difficult to locate at the source. However, the traditional traceability technology is susceptible to human tampering and centralization, and cannot guarantee data security. The double guarantee of using Beidou positioning module with indexed traceability code for dynamic supervision ensures that each bucket of milk powder has unique information and guarantees the authenticity of traceability data.

1.2. Project Introduction

Using the ultra-low power miniaturized Beidou positioning module to measure the distance between the known satellite and the receiver, and calculate the specific location through the computer, the spatial distance rear rendezvous method is adopted, together with the QR code as the unique cited traceability code, so that users can directly browse the traceability information flow of milk powder from the origin of milk to the whole sales process through the special traceability channel of the APP client, and obtain the traceability information flow from production to The source of raw materials, production information, logistics information, etc. from production to sales

2. Traceability system industry and based on the analysis of applications within the market

2.1. Industry Analysis

The traditional traceability system has some problems.

- 1) The supply chain system information standards are not uniform and the data are not connected.
- 2) Food information is not open and transparent, leading to mutual trust issues between the two parties.
- 3) The core data of the traceability system can be easily tampered with.
- 4) The traditional traceability system is fragmented, making it difficult to identify the responsible parties for food problems.
- 5) The system is heavily centralized, and the authenticity of information cannot be verified.

2.2. The traceability system based on BeiDou positioning system:

- (1) The production and logistics information of

commodities is made public through low-powered BeiDou positioning equipment, which can dynamically supervise the products, so that both sides of the information can get the real information of commodities in real time.

(2) The dual guarantee of Beidou positioning system combined with QR code technology prevents counterfeit products and has anti-counterfeiting function.

3. Market prospect analysis

(1) The state launches corresponding intra-industry guidelines, unifies industry standards, increases public credibility of the traceability system, and builds a true and efficient traceability system.

(2) The traceability system is more oriented to daily consumer goods and will focus more on anti-counterfeiting of equipment and consumables and anti-counterfeiting of upstream channels.

(3) The app developed by the anti-counterfeiting platform itself needs to maintain sufficient interaction with customers, enhance attractiveness and form user stickiness.

(4) The government platform is affected by a variety of factors and progress is slow, while the enterprise platform is small in volume, relatively focused and has a variety of modes, and the complementary intermingling of the two types of platforms is an important way to promote the continuous and healthy development of the traceability system.

The Beidou-3 global satellite navigation system marks the international leading level of China's satellite navigation and lays the material and technical foundation for the marketization, industrialization and internationalization of the Beidou system, and the Beidou industrialization and industrial Beidou empowerment promoted by the state are the focus of the implementation of the Beidou strategy during the 14th Five-Year Plan period, in which the traceability system profits. The industry certification of the Beidou system can do justice to the security of the traceability system, integrate the technology with the market, and improve the security of the traceability system.

4. Milk powder sales management system function overview

Five functions of the milk powder sales management system:

1). The product is based on Beidou positioning system, mainly including low-power Beidou positioning equipment, terminal and cloud server. The BeiDou locator attached to the bottom of the lid is the main device for all services to be realized, and the current location information of the device is obtained at regular intervals during its work, and if the location remains unchanged for a long time, it enters the hibernation mode. When the quality inspection department detects a substandard product or a consumer report can be immediately located, find the same batch of products and immediately recall or detain. At the same time can be traced to the specific production address and milk source address, the production enterprises to deal with the supervision.

2). Combined with the QR code technology, it is convenient to enter and read the complete information of milk powder from production to sale, and also prevent the appearance of counterfeit and shoddy products with anti-counterfeiting function. After the milk powder passes through the production line, the QR code is printed on the milk powder cans, and consumers can get the corresponding milk powder

production address, production time, production line, quality inspector and the corresponding Beidou chip serial number and other information in time by scanning the QR code.

3). The milk powder is shipped from the factory to open the positioning mode, and the positioning information is sent every other day and stored in the background database. If the address information remains unchanged for three consecutive days, the chip enters the sleep mode and starts to reposition after the acceleration is detected.

4). The database of the system can store two kinds of information. One is the basic information of the milk powder, and the other is the location information of the milk powder, both of which are linked by the serial number of the Beidou chip. The basic information of the milk powder has the serial number of the corresponding Beidou chip, so if you want to know the address information of the milk powder, you just need to call up the location information of the corresponding piece of Beidou chip.

5). this complete set of traceability supervision system, including APP client, users can log into the APP to scan the code to check the information of milk powder, but also a key to report, the regulatory department will immediately investigate after receiving the reported information, so that the supervision is more convenient and rapid, but also allows milk powder enterprises to gain credibility.

5. Operation Management and Marketing

5.1. Operations Management

1) Target Management

In order to better control the sales management system of milk powder production with Beidou positioning we set up clear sales targets and plans, including sales volume, sales, market share, etc., as well as specific methods and steps to achieve these targets and plans. We have also established a perfect sales organization and management process, and clearly defined the responsibilities and tasks of the whole system and the various departments and personnel with APP production and operation. An effective communication mechanism and collaboration mechanism has also been established to ensure the smooth development and later operation of the system.

2)Personnel training

Strengthened the training and management of promotion staff, including training and improvement of sales skills, product knowledge, market analysis ability, communication ability, and team cooperation ability, and established incentive mechanisms and performance evaluation systems. Sales data analysis and decision support system is established to provide in-depth understanding of industry situation and application trends through data collection, analysis and application, provide decision support and business optimization suggestions, optimize promotion process and strategy, and improve product profit and competitiveness. It also strengthened risk management and compliance management of promotion and operation, established risk assessment and prevention and control mechanisms, and enhanced training on relevant laws and regulations and compliance awareness to ensure legal compliance and safety and stability of the process.

3) Promotion work

To promote the Beidou Positioning System milk powder sales management system, we will set up official websites and

social media accounts, post product information and promotional content, and improve the search ranking of our website through SEO optimization. Participate in relevant industry exhibitions and trade shows to showcase products and provide product demonstrations to potential customers to attract their attention and interest. Promote products to potential operators and businesses through search engine advertising and social media ad placements to increase awareness and sales. You can also cooperate with partners in the same industry to promote product technology, such as results can be cooperated with mom-and-pop stores to set up product display cabinets in the stores to increase product exposure and publicity and improve the word-of-mouth communication effect.

5.2. Marketing

1) Marketing direction

The implementation of the Beidou positioning milk powder production and sales management system requires a multi-functional APP, so we made a long discussion about the setting and later operation of the APP. Only to let users really appreciate the added value of using the product.

Set clear goals and strategies: the first task of operating the app our clear goals and strategies are to improve user retention, increase the number of users, improve revenue, etc., and determine the operation plan based on the goals and strategies.

Continuous optimization of user experience: We know that optimizing user experience can help improve user satisfaction and retention, so we have simplified the registration process, provided better navigation and search functions, added social features, etc.

Implement effective marketing strategies: In order to attract more users, we implement effective marketing strategies, such as promoting through social media, attending trade shows, offering coupons, etc.

Analyze data and make decisions: To make decisions more informed and convincing, we analyze data to understand user behavior and feedback, such as user retention rate, usage frequency, and reasons for user churn, and then make corresponding decisions and adjustments based on the data.

Interaction and communication with users: Interaction and communication with users can help increase user loyalty and word of mouth, such as responding to user comments, providing online customer service, posting update announcements, etc.

Continuous updates and improvements: In order to stay competitive and attract more users, we need to constantly update and improve the app's functionality and performance, such as adding new features, improving speed and stability, optimizing the interface, etc.

2) Marketing Strategy

For government supervision and milk powder enterprise production safety, this project designs a milk powder traceability supervision system combined by Beidou positioning and QR code technology, which realizes real-time supervision of milk powder production and sales, as well as milk source traceability, so that consumers and food supervision departments can get all information of milk powder from production to sales, which is easy to manage and monitor the whole process from production to sales, and can make users consume with confidence. Therefore, in the positioning system, we are managing the positioning system, but also have their own safety management system.

A. Set system goals and targets: First of all, we need to clarify the goals and targets of the positioning system, such as real-time monitoring of logistics and transportation, improving positioning accuracy, etc.

B. Determine the scope of use and authority of the system: Determine the scope of use and authority of the system, such as which personnel can access the positioning system and what data they can see.

C. Establish data collection and analysis mechanism: Collecting and analyzing data is an important part of positioning system management, and a scientific and reasonable data collection and analysis mechanism needs to be established to analyze data regularly and find problems in time.

D. Maintenance of system equipment and software: The positioning system equipment and software need to be regularly maintained and upgraded to ensure the stability and accuracy of the system operation.

E. Establishing emergency processing mechanism: When there is an abnormal situation in the positioning system, an emergency processing mechanism needs to be established to solve the problem in time and ensure the normal operation of the system.

F. Training and management system users: Positioning system users need to receive professional training and management to ensure the use of norms and correctness.

H. Regular inspection and evaluation of system effect: Regularly inspect and evaluate the positioning system, find problems and improve it in time to improve the system effect and management level.

6. Risk prediction and risk control

6.1. Market risk

Market risk is the entrepreneurial risk resulting from the possibility of loss and uncertainty of profitability for a start-up business to conduct economic activities. The main market risk of the BeiDou location-based milk powder production and sales management system is that other traceability platform service providers in the market have better services and more inside market information to launch stronger sales strategies or play price wars to capture market share.

Market risk prevention countermeasures: adhere to the market-oriented business philosophy, develop the correct marketing concept and marketing strategy. Strengthen marketing management, do a good job in marketing and product after-sales service, and enhance customer loyalty. Pay more attention to market trends in the same industry to provide basic guidance for the company to develop market decisions.

6.2. Managing risk

The milk powder production and sales management system based on Beidou positioning is mainly due to the traceability service provided by the platform agent selling milk powder products from other suppliers. Milk powder sales are an important area involving food safety and must comply with relevant regulations and policies. To ensure that the products sold meet the relevant standards to ensure the health and safety of consumers. The quality of the products selected is not up to standard may cause certain trouble to customers, thus affecting their trust in this milk powder production and sales management system and affecting the Company's normal business operations.

Management risk prevention countermeasures: strengthen the screening of suppliers, ensure that the products of cooperative enterprises are legal and compliant, and carefully audit the production information of suppliers to avoid falsification.

6.3. Legal risks

Legal risk is the risk of breaking the law due to lack of legal knowledge or other reasons in the business activities of the enterprise.

The sale of milk powder involves national food safety regulations, so system development requires strict compliance with relevant laws and regulations to ensure that the products meet the relevant standards and regulations, or else you may be held legally responsible.

Legal risk prevention countermeasures: carefully study and understand the relevant legal provisions to avoid the risk of violations.

6.4. Technical Risks

Technology risk is the uncertainty of gains and losses due to the uncertainty of the technology or collection of technologies applied or proposed by science and technology and the uncertainty in the process of combining technology with other technological activities. The uncertainty of technology includes both the uncertainty of the function and growth of the technology itself now possessed and the uncertainty of changes in related technologies (complementary and alternative), thus including both static and dynamic technology risks. Although high technology has many advantages, intense competition between technologies is inevitable, and the interaction between technology and the environment makes it easy to lose its superiority, thus also devaluing the benefits. Competitiveness and process should be reflected in the concept of technology risk, so technology risk analysis should consider technology in a complex developing environment. [1]

The development of a Beidou positioning-based milk powder sales management system requires appropriate technical skills, including familiarity with Beidou positioning technology, software development and database management and other related technologies. If the team has insufficient technical skills or lacks relevant experience, technical problems may occur during the development process, resulting in the system not operating properly.

If there is a problem with the information transmission or cooperation with the Beidou positioning service provider, it will lead to the lack of technical support to the customer and cause certain impact to the customer.

The platform of milk powder production and sales management system based on Beidou positioning may have certain technical problems in the initial operation, unreasonable program design, program logic operation errors, etc.

Technical risk prevention countermeasures: Selecting reliable development teams and suppliers: Selecting experienced development teams and suppliers can reduce the risk in the development process. Adequate testing during the development process can help identify and solve problems. Also, establish a quality assurance system to monitor and manage the operation of the software to ensure the stability and reliability of the software. After the software goes online, continuous improvements and upgrades are required to ensure the perfection of software functions and optimization of user

experience. At the same time, vulnerabilities are fixed and security measures are strengthened in a timely manner to prevent security risks.

6.5. Data Security Risks

A data security risk is any threat or danger that could lead to unauthorized access, disclosure, destruction or misuse of data. Examples include hacker attacks, viruses and malware.

The sales management system of milk powder based on Beidou positioning needs to collect and store sensitive information such as users' personal information and transaction data. If the data security mechanism of the system is not perfect or there are loopholes, it may lead to user data leakage or hacking, thus causing incalculable losses.

Data security risk prevention measures: During the development process, the security of user data needs to be protected. Encryption technology, backup data and restricted access can be used to protect data security.

7. Conclusion

This paper firstly introduces some major milk powder safety incidents and introduces some relevant data for illustration to emphasize the importance of milk powder safety, based on which the proposal of establishing a formula milk powder traceability system based on Beidou system positioning is proposed, and introduces the concept of traceability system and its origin, as well as the research status and development of traceability system at home and abroad, and then specifically to the research status and development of milk powder at home and abroad. Then the research is divided into three parts: 1) Beidou positioning module: using the ultra-low power consumption and extremely miniaturized locator, the distance between the satellite with known position and the user receiver is measured by the Beidou positioning system, the data of the satellite is integrated to calculate the specific position of the receiver, and then the spatial distance rear rendezvous method is adopted based on the instantaneous position of the satellite with high speed movement as the known starting data, so as to determine the milk powder location information, such as latitude and longitude, location name, etc. 2) Traceability system: using QR code as the unique index traceability code. Consumers can login to the APP client to scan the code to get the information, and then they can see the milk powder production information, which includes the traceability information flow of each link of the whole process from milk source origin to sales. 3) APP production: set up a special traceability channel on the app, and through scanning the QR code and can directly browse the production information of milk powder from production to sales, logistics information, etc., and place the company's mini online Users can purchase other products of the company through the app, and can also check the outgoing and logistics information through the app after placing orders for products. When milk powder finally reaches consumers, it goes through many links from production to sales, and problems in each link may have an impact on the quality and safety of milk powder, so it is of great significance to establish a milk powder traceability sales management system based on Beidou positioning.

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References

- [1] He Shan. The development of medication reminder APP and its research on improving medication adherence. Anhui University of Science and Technology 2017.
- [2] Li Xue-ting. A brief analysis of the research and development of a small app for intelligent patient medication reminder.
- [3] 2022-2028 Global and Chinese Medication Reminder App Market Status and Future Development Trends.
- [4] Han W, Hu Ximin, Fu G, et al. Analysis of food and beverage consumption data based on campus-cartoon system [J]. Jiangsu Science and Technology Information, 2018,35(24):26-29.
- [5] Guo Peng. Research on the correlation between students' consumption behavior and grades based on campus one-card data [D]. Northwest Agriculture and Forestry University of Science and Technology, 2019.
- [6] Cao Fang, Zhang Han Yuan Construction of student canteen consumption portrait based on big data and its application, Guangdong Institute of Posts and Telecommunications Vocational Technology, 2020.19 (04).
- [7] Chen Qi, Research on refinement management of university canteens based on big data, Xuzhou Medical University Information Office, Science and Technology Wind 2022, (32), 74-76 DOI:10.19392j.cnki.1671-7341.202232025.
- [8] Shiyong Zheng , Muhammad Irfan, Fengyi Ai, Mamdouh Abdulaziz Saleh Al-Faryan, Do renewable energy, urbanisation, and natural resources enhance environmental quality in China? Evidence from novel bootstrap Fourier Granger causality in quantiles , Resources Policy (2023),doi: <https://doi.org/10.1016/j.resourpol.2023.103354>.
- [9] Zheng S, Ahmed D, Xie Y, Majeed MT, Hafeez M, Green growth and carbon neutrality targets in China: Do financial integration and ICT matter?, Journal of Cleaner Production (2023), doi: <https://doi.org/10.1016/j.jclepro.2023.136923>.
- [10] Zheng S, Shahzad M, Asif HM, Gao J, Muqet HA, Advanced optimizer for maximum power point tracking of photovoltaic systems in smart grid: A roadmap towards clean energy technologies, Renewable Energy (2023), doi: <https://doi.org/10.1016/j.renene.2023.01.023>.
- [11] Zhu J, Zheng S, Kaabar MKA and Yue X-G (2022), Online or offline? The impact of environmental knowledge acquisition on environmental behavior of Chinese farmers based on social capital perspective. Front. Environ. Sci. 10:1052797. doi: 10.3389/fenvs.2022.1052797.
- [12] Shiyong Zheng, Jiada Chen, Junyun Liao, Hsin-Li Hu. What motivates users' viewing and purchasing behavior motivations in live streaming: A stream-streamer-viewer perspective. Journal of Retailing and Consumer Services, 2023, 72:1-10. <https://doi.org/10.1016/j.jretconser.2022.103240>
- [13] Zheng, S.; Liu, H.; Guan, W.; Yang, Y.; Li, J.; Fahad, S.; Li, B. Identifying Intention-Based Factors Influencing Consumers' Willingness to Pay for Electric Vehicles: A Sustainable Consumption Paradigm. Sustainability 2022, 14, 16831. <https://doi.org/10.3390/su142416831>.
- [14] Zheng, S.; Ye, X.; Guan, W.; Yang, Y.; Li, J.; Li, B. Assessing the Influence of Green Innovation on the Market Performance of Small- and Medium-Sized Enterprises. Sustainability 2022, 14, 12977. <https://doi.org/10.3390/su142012977>.
- [15] Shiyong Zheng, Mingyue Wu & Junyun Liao (2022): The impact of destination live streaming on viewers' travel intention, Current Issues in Tourism, DOI: 10.1080 / 13683500.2022.2117594.
- [16] ShiYong Z, JiaYing L, Wei W, HaiJian W, Akram U, Lei W and BiQing L (2022) Effect of Seeding Strategy on the Efficiency of Brand Spreading in Complex Social Networks. Front. Psychol. 13:879274. doi: 10.3389/fpsyg.2022.879274.
- [17] ShiYong Z, JiaYing L, HaiJian W, Dukhaykh S, Lei W, BiQing L and Jei P (2022) Do Product Characteristics Affect Customers' Participation in Virtual Brand Communities? An Empirical Study. Front. Psychol. 12:792706. doi: 10.3389/fpsyg.2021.792706.
- [18] Zheng, S.; Cui, J.; Sun, C.; Li, J.; Li, B.; Guan, W. The Effects of the Type of Information Played in Environmentally Themed Short Videos on Social Media on People's Willingness to Protect the Environment. Int. J. Environ. Res. Public Health 2022, 19, 9520. doi:10.3390/ijerph19159520.
- [19] Wei Wang, Shiyong Zheng, Rizwan Ali, Jiaying Li (2022): Relevancy or Diversity? Recommendation Strategy Based on The Degree of Multi-Context Use of News Feed Users, Journal of Global Information Management, DOI: 10.4018 / JGIM.310929.
- [20] Xiao-Guang Yue, Yiyi Liao, Shiyong Zheng, Xuefeng Shao, Jing Gao (2022): The role of green innovation and tourism towards carbon neutrality in Thailand: Evidence from bootstrap ADRL approach, Journal of Environmental Management, doi: 10.1016 / j.jenvman.2021.112778.
- [21] Jun W, Shiyong Z and Yi T (2022) Does ESG Disclosure Help Improve Intangible Capital? Evidence From AShare Listed Companies. Front. Environ. Sci. 10:858548. doi: 10.3389 / fenvs.2022.858548.
- [22] Cai A, Zheng S, Cai L, Yang H and Comite U (2021) How Does Green Technology Innovation Affect Carbon Emissions? A Spatial Econometric Analysis of China's Provincial Panel Data. Front. Environ. Sci. 9:813811. doi: 10.3389 / fenvs.2021.813811.
- [23] Wang W, Huang M, Zheng S, Lin L and Wang L (2022) The Impact of Broadcasters on Consumer's Intention to Follow Livestream Brand Community. Front. Psychol. 12:810883. doi: 10.3389/fpsyg.2021.810883.
- [24] Zheng ShiYong, LiuMao Hong, HUANG Jinde (2019) The influence of community structure on the diffusion of knowledge-a view based on market segmentation, International Journal of Emerging Technologies in Learning, doi: 10.3991 / ijet.v14i08.10397.
- [25] Zheng, ShiYong, Jiang, SuPing (2019) Application research of an innovative online education model in big data environment, International Journal of Emerging Technologies in Learning, doi:10.3991/ijet.v14i08.10404.
- [26] Renping Zhang, Shiyong Zheng, Jiaying Li, Otilia Manta (2022) Research on the Influence of Socialization Strategy of Online Educating Platform on Users' Learning Behavior, International Journal of Emerging Technologies in Learning, doi.org / 10.3991 / ijet.v17i17.34031.