Design and Implementation of Aviation Dangerous Goods Science Popularization Platform

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Abstract. The safety of dangerous goods transportation is one of the important components of aviation safety. However, the transportation process of dangerous goods is complex, involving a large number of people, and the physical and chemical properties of dangerous goods are greatly different, which can easily cause serious consequences when the danger erupts. At present, the main ways for the general public and professionals to obtain knowledge about aviation dangerous goods are through enterprise promotional posters and active online searches, which limit the comprehensiveness and accuracy of the information obtained and have poor readability. How to instill safety awareness in all aspects of dangerous goods air transportation, especially in popularizing dangerous goods knowledge among the public, has become an important research direction in dangerous goods transportation. Therefore, this article aims to address the issues of narrow coverage, distorted information, and low dissemination efficiency in the current methods of promoting dangerous goods information. It aims to build a comprehensive, accurate, and readable aviation dangerous goods knowledge popularization activity resource service platform.

Keywords: Dangerous goods · safety · science popularization · internet · platforms

1 Introduction

The Civil Aviation Administration pointed out at the National Civil Aviation Safety Work Conference that "in 2018, the entire industry of civil aviation safety work should focus on six aspects of work [1]. Firstly, improve industry policies to improve the quality of safety development. Secondly, strengthen the construction of the" three foundations "and enhance the potential for safety development. The third is to focus on operational risks and deepen the governance of safety hazards. Strictly control the operational risks of airlines, air traffic control, airport operations, and dangerous goods air transportation. The fourth is to promote legal governance and improve the efficiency of safety supervision. The fifth is to strengthen airworthiness research and improve the quality of Chinese manufacturing and Chinese standards. Six is to establish a sound air defense security system based on national security.

The safety of dangerous goods transportation is one of the important components of aviation safety [2]. With the continuous increase in cargo volume at civil airports and the promulgation of regulations such as the "Regulations on the Management of Dangerous Goods Transport in Civil Aviation of China" (CCAR-276-R1), the requirements for the safety of dangerous goods transportation have become increasingly high [3]. While airlines have increased their economic benefits, due to the increase in the number and variety of dangerous goods consignments, there have been many lagging phenomena in the transportation management methods of dangerous goods [4]. For example, during the collection and transportation process, there is currently a waste of time in manually reviewing the "Dangerous Goods Rules", which cannot guarantee work efficiency and the accuracy of the information consulted; For the general public, they have a basic awareness of flight safety, but most do not understand specific requirements, some have a mentality of taking chances, and there are significant safety hazards; The current methods of promoting dangerous goods information have problems such as narrow coverage, distorted information, and low dissemination efficiency.

Therefore, the application of science popularization platforms can accelerate the speed of problem solving, meet the urgent needs of shippers, carriers, and the general public for boarding, reduce the time required to improve China's dangerous goods air transportation management system, and enable users to quickly obtain accurate information, saving passengers the time to inquire about airlines and network inquiries. By regularly promoting dangerous goods safety knowledge through mutual assistance platforms, we aim to enhance users' awareness of dangerous goods safety, reduce economic and time losses caused by mistakenly carrying prohibited and restricted items, and improve work efficiency and accuracy of information retrieval.

2 Analysis of the Current Research Status and Development Trend at Home and Abroad

2.1 The Application of Science Popularization APP in Mobile Internet

The so-called Science Popularization App is a third-party application developed primarily for mobile internet users, with the goal of disseminating scientific knowledge and enhancing user interest in science [5]. Science popularization app is mainly designed for users and consumers.

Many foreign research institutions have developed professional popular science apps that provide scientific knowledge and information [5]. Such as the Meteor Counter App developed by NASA, the Project Noah App developed by New York University in the United States, the iBats App developed by the London Institute of Zoology and the Bat Trust Research Association in London, the Bat Indicator Project developed by Columbia University in the United States Leafsnap App (automatic identification of tree species project) initiated by University of Maryland and Smithsonian Institution, eBird App (online bird observation project) initiated by ornithology Laboratory of Cornell University and Audubon Society of America, etc. These popular science apps are designed in novel forms and provide vivid user experiences, allowing users to enhance their understanding and learning of scientific knowledge in their daily life of intelligent mobile

device applications, increasing their scientific experience and interest, thereby achieving the goal of promoting the improvement of public scientific literacy.

Domestic science popularization app mainly focus on popular science popularization and entertainment education oriented, while professional science popularization app and specialized education oriented science popularization app are still in their early stages [5]. The science popularization app "Science Squirrel Club" is a popular science popularization app that is popular among young consumers in china and is released based on the same name science popularization website. It allows users to browse and learn about scientific information, articles, and works anytime and anywhere. In addition, there are many science popularization app developed in China based on magazines and newspapers with the same name, such as "Global Science", "Science New Life", "Science Popularity", etc. There are also popular science app for children's entertainment and learning, such as "The Discovery of Archimedes' Principle", "The Enlightenment of Water Vapor", "The Invention of Microscope", "The Family of the Solar System", "The Underwater World" and other APP applications, which can provide children with enlightenment education in natural science in a form that is easy to receive and enjoy.

2.2 Science Popularization APP in Technology Research and Development

There are many successful cases of popular science application products both domestically and internationally, and they have their own characteristics in technological development and application. For example, the mobile science popularization app developed by National Geographic magazine in the United States using intelligent algorithms can customize science popularization products according to users' personal preferences. It has rich content, strong interactivity, timeliness, and convenient mobility, and is loved by a large number of users. In 2012, the Beijing Association of Science and Technology launched the first science popularization website in China to build a cloud computing technology platform – "Tadpole Staff". It is the first combination of cloud computing technology and science popularization informatization in China, and is a powerful means to promote science popularization informatization and improve service levels. It has pioneered the application of cloud computing technology in the field of science popularization informatization. In 2013, the Hubei Provincial Association for Science and Technology, in collaboration with the Wuhan Botanical Garden of the Chinese Academy of Sciences and the Hubei Science Popularization Resource Open Sharing Alliance, launched the construction of a science popularization resource informatization platform, providing the public with learnable, visible, and movable resources A popular science resource package that can be visited. The Chinese Academy of Sciences has developed a cloud based science popularization APP information platform using technologies such as virtual simulation and online interaction, vividly and interestingly showcasing science popularization knowledge. At present, the development of science popularization apps mainly includes various clients (Android, IOS, WP, etc.) and server (mainstream languages Java, Php, etc.). At the same time, 3D simulation, panoramic, video and other technologies have gradually been applied to the development of science popularization app platforms, providing rich effects for the diversification of science popularization apps.

To sum up, the "Internet plus + Science Popularization" campaign, which uses modern digital information technology and the Internet as a communication platform and is carried out by specialized organizations or individuals on the Internet to target Internet users, has become an important means of national science popularization work and scientific and technological knowledge publicity. "Internet plus + Science Popularization" is not only richer in content and more diverse in form, but also more convenient and fast. It not only makes the public truly become recipients of scientific and technological knowledge and information, but also makes them become creators and sharers. In summary, the development of science popularization apps in China has not yet formed a certain professional trend, and there is no reasonable connection between development and demand. Science popularization apps with professionalism, practicality, and interactive participation will become a new medium and approach for science dissemination in China.

3 Design of Aviation Dangerous Goods Science Popularization Platform

3.1 Classification of Aviation Dangerous Goods

There are various types of dangerous goods with various characteristics, and some even have mixed characteristics, which can easily cause accidents such as combustion and poisoning during production, transportation, and storage. Therefore, the consequences of dangerous goods transportation accidents are much more serious than those of general goods transportation, and although the accident rate of air transportation is lower than other transportation methods, once an accident occurs, it will cause great losses.

According to the regulations, theoretically every chemical should have a safety technical manual. The shipper of the goods can confirm the danger classification and deliver the goods based on the manual, and the receiving department can conduct a collection inspection by checking the manual. However, in the actual transportation process, the civil aviation transportation department usually does not fully rely on the safety technical specifications of chemicals. The packaged chemicals are not directly in contact with the relevant personnel during transportation, so the classification of dangerous goods transported by air is based on the "Recommendations on the Transport of Dangerous Goods - Model Regulations" issued by the United Nations, which is only divided into 9 categories [6, 7],which is shown in table 1.

3.2 Functional Design

The platform adopts a common three-layer architecture and is implemented through a browser server mode. Its functional design mainly includes front-end management design and back-end management design. The platform has set up intelligent search web pages to help passengers conveniently and accurately check whether they have any items that affect aviation safety before taking a flight, popularize life safety knowledge, improve user search convenience and accuracy, and consider airline differentiation regulations to summarize some domestic airline contact information, further enriching user search channels.

Table 1. Classification of Dangerous Goods by Air Transport

Class 1	Explosives	
Class 2	flammable, compressed or toxic gases	
Class 3	flammable liquid	
Class 4	Flammable Solids	
Class 5	oxidizing substances and organic peroxides	
Class 6	toxic and infectious substances	
Class 7	radioactive substances	
Class 8	corrosive substances	
Class 9	Miscellaneous Hazardous Materials	

The platform is mainly divided into four modules, namely "Safety Common Sense", "Travel Restrictions", "Dangerous Goods Classification", and "Discovery and Sharing". The safety knowledge module can provide you with safety knowledge about clothing, food, housing, and transportation, including social hot safety issues and the safe use of common living facilities and equipment. The ride restriction board module comprehensively considers the classification modes of various e-commerce platforms, and basically covers various items in users' daily lives. Including "electronic products", "daily necessities", "outdoor supplies", "medical supplies", and "other categories". The hazardous

material classification module can query various hazardous material classifications, hazard levels, and hazard situations. The Discovery and Sharing module allows users to share their personal experiences and discoveries around them, providing reference and warning for others.

In addition, the platform will regularly release news, policies and regulations, application demonstrations, knowledge Q&A, science popularization activities, and science popularization lectures related to aviation dangerous goods and safety, highlighting the science popularization interaction function with the public, and strengthening user interaction through content sharing, friend circle forwarding, Q&A interaction, online testing, science popularization games, online classrooms, and other methods.

3.3 Platform Technology Implementation

The platform adopts B/S access method, which means that the client browser (or mobile terminals such as mobile phones and PADs) accesses the server. The development and deployment of server-side applications adopt a LAMP based model, which is based on the Linux operating system, Apache server, MySQL database, and PHP development language. In order to improve server performance and meet the needs of large amounts of mobile data access, the server establishes a memory cache object system through performance optimization, and business logic directly accesses the cache system to improve data reading efficiency. At the same time, establish connection communication between users and proxy servers and page caching systems to achieve high concurrency access to the server.

4 Conclusion

This article combines the creation of independent science popularization resources with the promotion of mobile internet science popularization, fully integrating knowledge, interactivity, and fun, to design an aviation dangerous goods science popularization platform. The platform enhances the attractiveness of science to the general public, provides an important platform for people from different knowledge backgrounds to learn and understand together, and improves the popularization of aviation dangerous goods knowledge, public awareness, and the quality of industry practitioners.

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