Research on Networked Product Packaging Design Based on Internet of Things Technology

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Abstract. In recent years, with the improvement of Internet of Things technology and the continuous improvement of economic level, people's consumption consciousness has also changed, especially for the packaging of networked products put forward higher requirements. This paper mainly studies the visual expression of networked product based on Internet of Things technology. Starting from the increasing influence of Internet electronic consumption in China's economic consumption system, this paper deeply discusses the systematic product logistics packaging design under the Internet consumption form. This paper analyzes and discusses the differences between Internet consumer commodity packaging and physical consumer commodity packaging in functional orientation, added value of packaging, systematic visual design and other aspects.

Keywords: Internet of Things Technology, Networked Products, Package Design

Introduction
The rise of the Internet drives the development of e-commerce, and the network marketing model has gradually entered people's life and become a new profit point. Shop products are diverse, product packaging dazzling. The sale of goods goes from offline to online, which brings convenience to People's Daily life, and also expands sales and increases profits for merchants. In the fierce market competition, it is essential for enterprises to improve their core values if they want to stand out and manage for a long time. And the important means to convey the core value is to establish brand awareness, using the means of brand communication, so that the core value of the enterprise into the hearts of consumers. With the penetration of the network, the ways of publicity and promotion have been expanded. Through the new media communication means generated by the network, consumers have had a more comprehensive interaction. This is exactly what traditional media cannot reach [1]. In the competitive market environment, the establishment of the brand has a certain inevitability. Excellent enterprise, has its own independent brand image, and independent personality, has a clear positioning and business philosophy, in the development of products, visual form a unified visual image. The simplest and most effective way is to establish the enterprise's own visual identification system [2].

Foreign fruit and vegetable packaging compared with the design of domestic fruit and vegetable packaging is more mature. Its product transportation display is very identifiable, and its brand cultural
awareness is more important than that in China. Its design concept is also from the analysis of natural elements, beautiful but not grandiose. The design of box type is also more diverse, which is worthy of our learning and reference [3]. In the design of fruit and vegetable packaging in the United States, designers are accustomed to use white space and powerful colors to put them together in a large area, or to highlight the theme meaning of packaging, and the way of pushing and pulling is in line with people's demand for convenient packaging [4].

In this paper, the networked product packaging for a series of design and creation, to brand digitalization, design standardization, packaging transparency of fresh product packaging design research, to try to solve the product packaging brand publicity, visual communication problems.

1. Networked Product Packaging Design under Internet of Things Technology

1.1 Product Packaging in the Context of the Internet of Things

(1) The development trend of packaging in the environment of the Internet of Things

With the advent of the Internet of Things economy, more and more consumer activities are attached to the information network. They can not only query relevant information, but also rely on the Internet for consumption and use the platform to complete transactions [5]. Consumption under the background of Internet economy is influenced by information and big data analysis. Fruit and vegetable packaging can also be collected and analyzed by using receipts to further discover consumer needs. It can also easily obtain the relevant information of place of origin and production time through the two-dimensional code scan, bringing better consumption experience to consumers [6].

(2) Design requirements

Through market research, it is found that consumers have a high voice for the following packaging design:

Green environment-friendly packaging. Namely, packaging can protect the efficiency of ecological environment, improve the coordination of packaging ecological environment, and reduce the load and impact of packaging on environmental products. As a natural and healthy food, fruits and vegetables should develop green and environment-friendly packaging design, which is not only the protection of the ecological environment for consumers, but also the performance of the quality of enterprises.

Simplified and transparent packaging. Many packaging abroad in order to meet the needs of consumers, in the packaging design of transparent materials to achieve product display, to ensure that the product is damaged, so that consumers for packaging box products at a glance. That is to meet the needs of consumers, but also for the packaging design added a bit of fun.

Mobile Internet and interactive technology combined packaging. Nowadays, in the era of the Internet of Things, the information intelligent technology is applied to the fruit and vegetable packaging, and the two-dimensional code technology is used to manage the circulation of products, so that the products are in storage. Transport; during this period, fruit growers and consumers can monitor the comprehensive information of fruits and vegetables at any time, thus building a bridge between consumers and products and attracting consumers' attention [7, 8].

1.2 Design Concept and Realization of Network Product Packaging

(1) Design practice

After the investigation and summary of online fresh products, the packaging design principles and design schemes of online fresh products have gradually emerged. The redesigned packaging of online fresh products needs to strengthen the design concept in the three key aspects of function realization, added value and environmental responsibility, among which the primary design innovation point is the redesign of the functional value concept of packaging [9, 10]. Specific practical design methods are as follows:

First, for the online shopping of fresh products logistics packaging innovation design, the design plan will be fresh products logistics packaging design into a standardized "integration-decomposition" structure, the original corrugated paper, foam box, ice bag packaging to replace the firm hard plastic
packaging box. In the packaging box, the functional structure is replanned, and an empty bin with ice filling space is designed for fresh products, so as to realize the standardized filling of ice quantity and ice quality. At the same time, the structure of ice bin is divided to enhance the compression resistance and smash resistance of packaging. In this paper, the hexagonal combination logistics packaging design of bionic honeycomb is adopted. Its primary design intention is to borrow the ultra-stable structure of honeycomb, which can unload most of the external impact force in the process of transporting fresh products, and replace the buffer outer packaging in the traditional online fresh logistics. In the traditional fresh logistics packaging, corrugated boxes are usually used as transportation buffer material, but because of their vulnerability, they are usually used as one-time logistics packaging. In the long run, it will waste a lot of pulp and even wood and bring great burden for environmental protection. If the recyclable and reusable honeycomb-type mother box is used as the logistics packaging of fresh products, the pressure of recycling waste packaging materials can be greatly relieved and the cost of environmental protection treatment can be reduced.

Second, design a complete visual management system for the logistics packaging box, systematize the writing and reading of the logistics text information, and functionalize the design of the logistics visual communication. The specific design work is to realize the modularization of the information area on the logistics packaging box of fresh products, standardize the writing scope and marking method, so that the deliverers and users can efficiently complete the express business [11, 12].

In the specific design practice and honeycomb type logistics packaging reflects is the design idea of unified planning and logistics information management, the inner packing of fresh products fit into the hive box structure shows two sides to the user, is designed to be unified, easy to identify, clear information interface, design shows the systematic information area are the efficiency and standardization of product packaging information era.

Third, use standard, unified color tag and pattern identification simplify classification in logistics, delivery, management, quality control work, especially for fresh products logistics packaging design a set of complete color warning system, such as seafood crayfish is set on the top of the quality assurance requirements as the main body in the red packaging visual, in low level of fish meat as the main body in the orange packaging visual design, again for low level of fresh fruit as the main body in the yellow packaging visual design, for the average agriculture design for green vegetables and fruits visual main body, and so on of logistics packaging visual communication system can through the color identification, to quickly determine coefficient of early warning of preservation of fresh products, to reduce the raw product safety threat at the same time improve the efficiency of delivery and quality of delivery.

Fourth, based on the concept of environmental protection can be recycled packaging design principles. In the traditional sense, although the logistics packaging design of fresh products mentioned above has the problem of high cost of packaging materials and packaging technology, the problem of packaging cost will be solved easily once the recovery system of special logistics packaging of fresh products is built.

Fifth, the independence of commodity packaging design. On the basis of determining the design of recyclable logistics packaging, additional design requirements for the inner packaging of goods are generated. This part of packaging belongs to the product packaging design which is in direct contact with the product. The following two aspects need to be achieved in the design practice: First, the standardization and standardization design of the inner package. The size and package capacity of the package body can be identified, so that consumers can accurately judge the quantity and quality of goods when receiving express, and reduce the contradiction between the picture of similar goods and the real goods. The second is to carry on the branding treatment to the commodity packaging design, the establishment of a complete brand visual communication design, through the pattern decoration to establish the brand atmosphere, for the fresh product packaging to build natural, safe, straightforward, simple, wild packaging character.
2. Survey on Networked Product Packaging

2.1 Questionnaire Survey
This article carries on the sampling survey to the university student in a certain university in this city, with the paper survey questionnaire as the survey method. Students majoring in design and computer science are the research objects. A total of 200 questionnaires were sent out and 186 were effectively received with an effective recovery rate of 93%.

In order to ensure the validity of the questionnaire, experts in packaging design, Internet of Things and other aspects were invited to conduct a comprehensive review and evaluation of the questionnaire on the test items and the scope of the content involved. After consultation with experts, experts are asked to make a judgment on the appropriateness of each indicator. Experts believe that the recognition degree of each indicator is relatively high, the representativeness between items is good, and the overall content validity of the questionnaire is good, indicating that the questionnaire content is effective.

2.2 Mathematical Statistics
In this paper, SPSS200 data statistics software is used to encode and input the valid data obtained from the questionnaire, and further conduct reliability and validity test, descriptive statistics, t-test, correlation analysis and regression analysis, so as to provide data support for the quantitative research of this paper. The t-test formula used in this paper is as follows:

\[
t = \frac{\bar{x}_1 - \bar{x}_2}{\frac{s}{\sqrt{n}}}
\]

(1)

\[
t = \frac{d - \mu_0}{\frac{s_d}{\sqrt{n}}}
\]

(2)

3. Survey Results

3.1 Internet of Things Technology Network Product Packaging Acceptance
This paper conducted a questionnaire survey on the acceptance degree of networked product packaging applied by Internet of Things technology among college students. From highly approved to not accepted, it was divided into four grades, which were marked as A, B, C and D respectively.

| Number of people | A     | B     | C     | D     |
|------------------|-------|-------|-------|-------|
| Proportion       | 46.77%| 27.96%| 17.44%| 17.2% |

As shown in Table 1 and Figure 1, the application of the technology of Internet of things network product packaging, there are 87 students in recognition, 46.77% of the total, they think that the application of Internet of things technology of networked product packaging to enhance the security of online shopping goods, timeliness and convenience, can greatly enhance the shopping experience; 52 students approved, accounting for 27.96; Fifteen students, accounting for 17.44%, said they did not care about it, believing that it would not affect their online shopping. Thirty-two students, or 17.2 percent, disagreed, saying it would raise the cost of online shopping and lead to excessive packaging. According to the results of the questionnaire survey, most students acknowledge and accept the networked products that apply the Internet of Things technology. At the same time, it is also important to take into account the objections raised by those who do not agree with the idea that networked product packaging using IoT technology will increase the cost of online shopping and lead to excessive packaging.
This paper conducted a questionnaire survey on the occurrence frequency of networked product packaging using Internet of Things technology among online shoppers among college students. From frequent contact to no contact with relevant packaging, it was successively divided into four grades, which were recorded as 1, 2, 3 and 4 respectively.

As shown in Figure 2, only 11 students, accounting for 5.91%, frequently contact the networked product packaging that applies the Internet of Things technology in online shopping. 41 students said they had contact with related product packaging, but it was relatively rare, accounting for 22.05%; the remaining 134 students said they had never seen relevant product packaging online, accounting for 72.04 percent. The above questionnaire survey results show that networked product packaging using Internet of Things technology has not been popularized in online shopping.

4. Conclusions
With the market economy era wind its cloud strange business competition is increasingly fierce, how to change in industrial technology wave and new business models booster strong breeze, positive for both the packaging products under the new situation of reposition, formation has strong practical significance and economic value of innovative design, not only become the focus of the current packaging design, it is also the problem that packaging design must solve and the way out for
development. Through research, it is found that in the era of the Internet of Things, the development of Internet technology can realize the interaction between consumers and products, and more effectively improve the work efficiency of relevant personnel. Using scan two-dimensional code, employees can effectively monitor product transportation information, and consumers can directly choose product specifications. However, in the process of creation, there are also some regrets, failing to solve the product in the transportation process of the lack of fresh technology and box structure will be bound by the traditional box design ideas, not bold and innovative. Thus it can be seen that there are still big problems in packaging design, and the whole design environment still has a lot of room for improvement.

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