Revolutionizing Embedded Systems: The Marketing Integration of Digital Publishing and Traditional Publishing Through the Internet of Things and Fuzzy Control Algorithm

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Abstract. With the rapid development of information technology, digital publishing has come into being. Digital publishing has solved the drawbacks of traditional paper publishing and received people's love. However, at this stage, there are many problems in the marketing integration development of digital publishing and traditional publishing in China. Including the backward concept of transformation, lack of content mining, and insufficient quality of talents. The combination of IoT and fuzzy control algorithm brings an opportunity to the fusion development of digital publishing and traditional publishing. The article constructs an evaluation index system for the fusion development of digital and traditional publishing based on IoT and fuzzy control algorithm to help digital publishing enterprises that are transforming. The model is divided into two major parts. The first part is an evaluation system for data quality, and the second part is the evaluation system for the selection of target users. The quality and level of these two steps of digital publishing products are related to the development of digital publishing enterprises as a whole. The model constructed in this paper is enhanced from these two perspectives, which is of great significance in facilitating the transition from traditional publishing enterprises to digital publishing enterprises, and, also, can give a practical and referenceable index system for publishing enterprises in transition.

Keywords: Internet of things, fuzzy control, digital publishing, traditional publishing, marketing integration development; Revolutionizing Embedded Systems
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1 INTRODUCTION

The traditional publishing method uses paper as the transmission medium, and the publishing stage mainly involves three steps: editing of content, paper printing, and distribution for sale, and the products of publishing are mainly newspapers, periodicals, and books. In the era when the Internet

was not yet popular, paper materials were an important carrier for acquiring knowledge and disseminating information. However, with the rapid development of the Internet, electronic resources came into being. Compared with paper books, which are bulky and difficult to keep, electronic resources, which are light and easy to obtain, are more favored by people. Digital publishing is a new way of publishing, which mainly combines modern information technology with traditional publishing industry, using digital technology to obtain information resources, and edit and publish them, and finally the process of earning benefits. The birth of digital publishing has extended the traditional publishing model. Traditional publishing is mainly a single paper book, while digital publishing is more diverse. It mainly includes, e-books, original online literature, games, etc. The specific classification is shown in Figure 1. For publishers, the distribution process of traditional paper books often has the problem of inventory backlog. For consumers, paper books are inconvenient to carry and more expensive. All these factors lead to an increasing willingness to distribute and purchase digital publishing products, and the market for traditional publishing products is getting smaller and smaller. Major traditional publishers have transformed to digital publishing, but encountered various difficulties. On the one hand, it is because their thinking is too backward, and on the other hand, it is because the digital publishing model is not mature enough and there are still technical bottlenecks that are difficult to break through [4],[6].
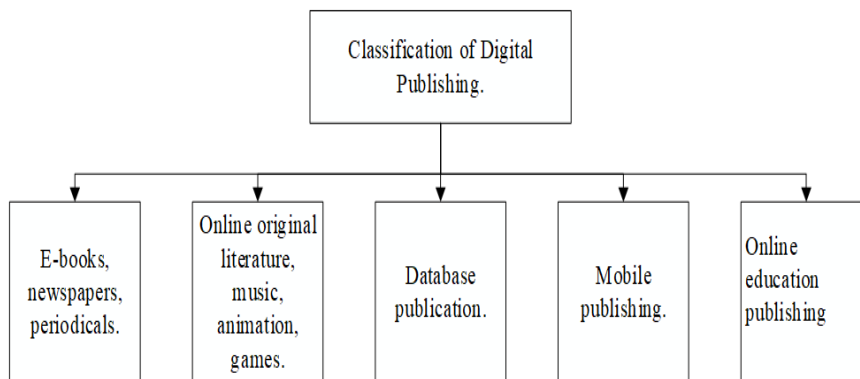

Figure 1: Classification of Digital Publishing.

The process of traditional publishing is mainly that the originator provides the content, the publisher provides editing and review, the distributor is responsible for sales, and the print manufacturing industry is responsible for the specific printing production. The main process of digital publishing, on the other hand, is that the original creator creates the content, edits it by himself, and the platform of the mailbox carries out the audit, and after the audit, the user can read it. Compared with traditional publishing, digital publishing has significant superiority in terms of publishing time and richness of content [14],[17]. The model of digital publishing and traditional publishing are specified in Figure 2 and Figure 3.

The Internet of Things (IoT) is developed on the basis of the Internet and is capable of connecting things to things, people to things, and achieving interconnection between communication media. The principle of the role of the Internet of Things is to collect information quickly through perceptron, and the information is transmitted and exchanged through transmission media, with functions such as collecting information, positioning, and tracking.
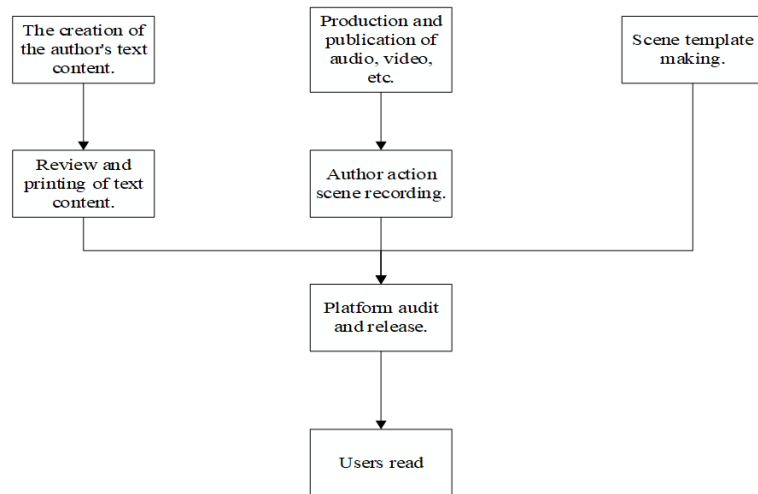
Figure 2: Digital Publishing Model.
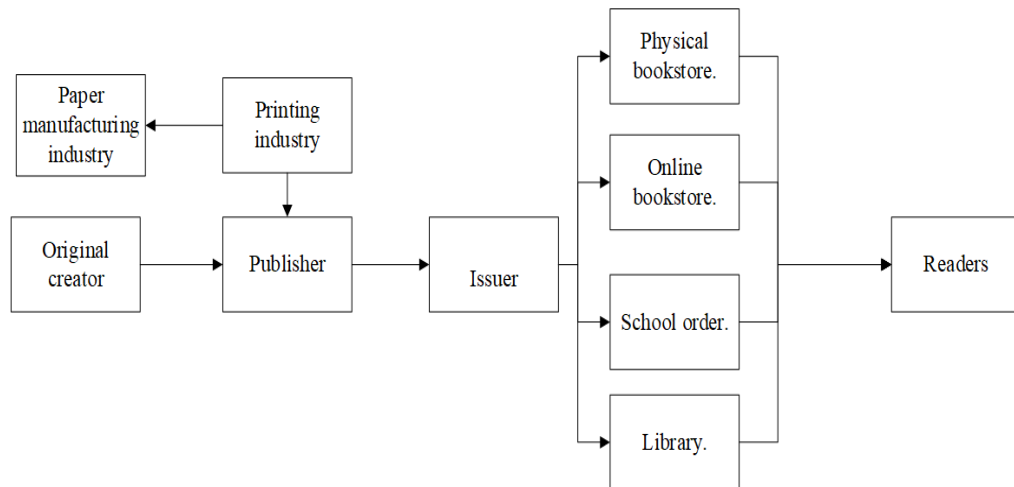
Figure 3: Traditional Publishing Model.

IoT has a wide range of applications in various fields, including smart warehouse, smart logistics, smart medical care, etc. Fuzzy control is a model constructed by applying the theoretical knowledge of fuzzy mathematics to make control decisions. With the increasing complexity of systems in modern society, and the form of information from low-dimensional simple data to high-dimensional complex structured, semi-structured and unstructured information [18],[13]. The correctness analysis of data and the extraction of feature vectors become increasingly difficult. Traditional control theory models must require accurate numerical features, but this requirement is becoming increasingly difficult to achieve as the complexity of the system continues to increase. In order to solve this problem, we must control mode from exact control to fuzzy control. The fuzzy control system mainly includes the definition of variables, fuzzification, construction of knowledge base, and logical judgment [24],[15].Embedded systems in IoT applications are typically equipped with

sensors and actuators that enable them to interact with the physical world. These systems can gather information from their surroundings, such as temperature, humidity, light intensity, or motion, and transmit it to other devices or the cloud for further processing and analysis.

2 PROBLEMS OF TRANSFORMATION FROM TRADITIONAL PUBLISHING TO DIGITAL PUBLISHING

After investigation, the transformation of traditional publishing to digital publishing in China has the following problems, among which the backward concept of transformation, lack of content mining and insufficient quality of talents are the three most serious problems. This reflects that there are still great problems in China's traditional publishing to digital publishing. The specific problems are shown in Table 1 [23],[2].

Problems	Proportion
Uneven industry development	0.11
Backward profit model	0.06
Digital copyright work	0.07
Backward concept of transformation	0.18
Lack of content mining	0.24
Insufficient talent quality	0.33

Table 1: Problems that Still Exist in Traditional Publishing to Digital Publishing.

2.1 Deep-Rooted Traditional Publishing Concepts

With the development of information technology and the expansion of the industrial scope of the digital publishing industry, more and more traditional publishing enterprises are transforming to digital publishing, emulating its information processing, processing, usage, and business model. However, because these enterprises have been operating traditional publishing industry for a long time, the transformation to digital publishing in the short term has achieved certain results, but many of them end up in failure due to the deep-rootedness of their industrial models. The transformation of traditional publishing industry to digital publishing industry requires not only the transformation of ideas, but also the transformation of system. The traditional publishing industry is protected by policies and institutions, and its industrial model is more solid, facing more difficulties in the transition process. The digital publishing industry, on the other hand, is a product of market development. This leads to the difference between digital publishing and traditional publishing, they are both publishing industry on the surface, but the institutional model and the operation of enterprises are completely different [19][8].

2.2 The Traditional Publishing Industry Lacks the Ability to Adapt to New Technologies and New Industries

As the traditional publishing industry is too old-fashioned in its thinking, many enterprises are torn between transformation and non-transformation, and often miss the great opportunity of transformation. The development of a new industry is a test of an enterprise's ability to control new technologies, but in practice, the following points often arise. First is the intention to develop digital publishing, but do not know how to do it. The second is to have a certain resource base, but do not know how to use it, and the industry only stays at the general level. Finally, the higher level of the development of digital industry stability, but the lack of talent, resulting in the enterprise cannot be further developed. Faced with the rapid development of digital publishing industry, the traditional

publishing industry must rely on internal and external forces to embark on the road of innovation and change their inherent industrial model [16][5].

2.3 The Traditional Publishing Industry Lacks the Excavation of High-Quality Content

Many traditional publishing industries only present their original content for paper printing to users in electronic form, shifting from paper text to electronic text, without changing the form and lacking the excavation of content. Many companies just want to seize the opportunity of the new industry and get the benefit quickly, without conducting in-depth research on the digital publishing industry, which leads to the lack of interesting content of the publication. The competitiveness of digital publishing itself is not fully utilized and does not meet the needs of users. At the same time, the digital publishing industry lacks its own industry standards because it is a new industry. The format of data is not unified, and there are differences in the terminals of digital publishing and the software used, which can lead to information flow blockage, which gives many enterprises big difficulties in developing digital publishing [11][12].

3 ASSESSMENT MODEL OF DIGITAL PUBLISHING AND TRADITIONAL PUBLISHING MARKETING INTEGRATION DEVELOPMENT BASED ON INTERNET OF THINGS AND FUZZY CONTROL ALGORITHM

3.1 Model Idea

By investigating the digital publishing model of 10 publishing houses in City A, we summarize the basic model of digital publishing as Figure 4.
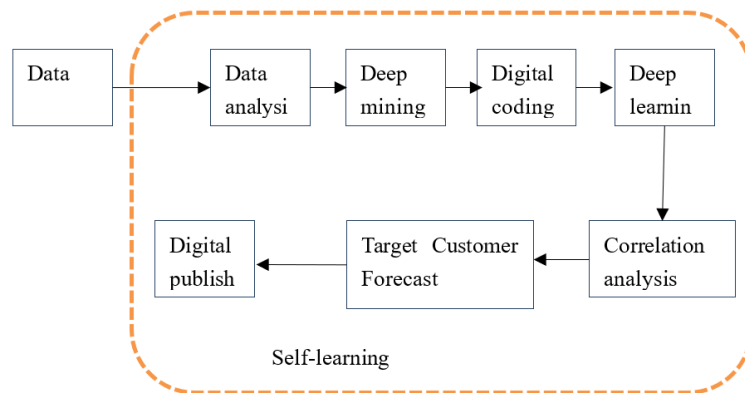
Figure 4: Development Model of Digital Publishing.

As shown in Figure 4, digital publishing mainly involves data analysis, data mining, data coding, and deep learning and relevance analysis as well as target customer prediction, so the digital publishing model can be subdivided into the processing of numbers and the selection of target customers [20],[21].

We build the model evaluation of digital publishing in two steps, firstly, we build the data processing index system. Then, we build the target customer selection index system. The former is to control the quality of digital processing, and the latter is to enhance the accurate placement of digital publishing works and improve customer satisfaction [9][1].

3.2 Premise Assumptions

H1: Assume that the data entering the data processing system is always legal and there is no incomplete, inconsistent and redundant system

H2:Assume that the behavioral intention of target customers is stable and not influenced by other factors

3.3 Technology Base

IoT sensors can collect information about users, obtain their media access, detect their interest preferences, and can access their access preferences. And IoT can quickly pass the data obtained from the object terminals to the processing analyzer in the background for analysis. Fuzzy control is built on the theory of fuzzy set, which is extremely useful for analyzing incomplete data and imprecise data. The data in this constructed model are obtained from various mobile terminals, and the accuracy of data and numerical precision are difficult to guarantee, and most of them are incomplete data, so this model must be processed by the method of fuzzy control.

3.4 Construction of Index Evaluation System Model

3.4.1. Construction of digital processing index system

Step 1: Firstly, refer to the table of indicators system for measuring the high-quality development level of digital publishing industry, and select the indicators related to digital quality in the table as the candidate indicators of this model.

Step 2: The entropy value method in fuzzy theory is an important method to calculate the variation degree of indicator values, and using the entropy value method can help to select the correlation, difference and relevance of the indicators to be evaluated.

$$
P_{rc} = \begin{bmatrix} x_{11} & \cdots & x_{1C} \\ \vdots & & \vdots \\ x_{R1} & \cdots & x_{RC} \end{bmatrix}
\tag{1}
$$

Step 3: Due to the in the indicator. The data are complex and diverse, the data in the indicators must be normalized. In order to facilitate the computational operation of the post-order we use the polar difference method to focus the indicator variables in the evaluation system between the interval [-1,1]. The formulas used for updating are shown in Formula (2) and (3), where Formula (2) is the normalization formula for positive indicators and Formula (3) is the normalization formula for negative indicators. Where max (xcr) represents the maximum value of the element in the indicator system and min (xcr) represents the minimum value of the element in the indicator system. pij represents the normalized indicator element. The specific formula is shown in Formula (4) [10][22].

$$
P_{rc} = \frac{x_{rc} - min(x_{rc})}{max(x_{rc}) - min(x_{rc})}
\tag{2}
$$

$$
P_{rc} = \frac{max(x_{rc}) - x_{rc}}{max(x_{rc}) - min(x_{rc})}
\tag{3}
$$

$$S_{rc} = \frac{P_{rc}}{\sum_{r=1}^{R} P_{rc}}$$

(4)

Step 4: Calculate the upper limb of the indicator of the rth element of class c in the indicator system, and use er to denote the entropy value of the rth element, the specific formula is shown in Formula (5).

$$e_c = -\frac{1}{lnL} \sum_{c=1}^{C} S_{rc} \ln S_{rc}$$

(5)

Step 5: Use the result of Formula (5) to calculate the utility value of the rth indicator, which is positively correlated with the weight, as shown in Formula (6).

$$g_c = 1 - e_c$$

(6)

Step 6: The utility values calculated by Formula (6) are used to calculate the weights to obtain the weights of each indicator. This is shown in Formula (7).

$$W_c = \frac{g_c}{\sum_{c=1}^{C} g_c}$$

(7)

Step 7: The weights are aggregated and the resulting data are transformed to the standard, as shown in Formula (8).

$$F_c = \sum_{c=1}^{C} W_c P_{rc}$$

(8)

Step 8: The results obtained from h1 are filtered, and the resulting elements are substituted for specific indicators, as shown in Table 2

Indicators	Weights
Value	0.38
Truthfulness	0.11
Causal integrity	0.09
Timeliness	0.06
Dynamism (variability)	0.06

Table 2: Digital Quality Evaluation Index System.

3.4.2. Construction of index system for target customer selection

When a digital publishing enterprise has a new project to put into the market, it must first examine the target users, and by using the Internet of Things technology to obtain the user's usage information, browsing information, and access information, and then these data can be obtained through big data analysis and fuzzy control of the user's browsing preferences. Thus, we can decide whether to put the item to the user or not. The index system of target user selection is more difficult than the index system of digital evaluation [7][3].

Step 1:

$$\sigma_p^2 = \frac{1}{n}B\text{pr} + \alpha - \frac{1}{n}:H\text{ir}$$

(9)

Step 2: After obtaining the data sensed by the IoT sensors, these data must be transmitted to the grassroots big data analysis system for analysis, in which the specific process of analysis is shown in Formula (9). After the processing of Formula (9), we are able to initially screen out suspicious data and use big data technology for clustering analysis.

$$\sigma_m^2 = \omega_1 H\text{ir}9R_1, R_m : +$$
$$\omega_2 H\text{ir}9R_2, R_m : + \ldots + \omega_n H\text{ir}9R_n, Rm :$$

(10)

Step 3: The data from the initial screening of big data will be analyzed at a deeper level, and the specific analysis process is shown in Formula (11). After the analysis of Formula (11), we can obtain the raw data for indicator analysis.

$$Cov9R_i, R_m := \beta_i \sigma_m^2$$

(11)

Step 5: The construction of the target customer selection index system is more complex, after Formula (9)-(11) processing of the original data, in order to ensure the integrity and reliability of the data, we conduct further data correctness test on the data, the specific formula as shown in Formula (12), if Formula (12) holds, the data is correct, otherwise it is wrong.

$$\sum_{i=1}^{n} \omega_i \beta_i = 1$$

(12)

Step 6: After the data are processed, the fuzzy control knowledge can be used to construct the target customer selection index system, and the specific steps are the same as the above index system for evaluating the numbers.

Step 7: The results obtained from the analysis in step 6 will be screened again to obtain the final weighting table. The formula used for the screening is Formula (13), and Table 3 is the index system table obtained from the analysis.

$$\begin{cases} P_{sc2}(t) = P_{sc}(t) + \Delta P_{sc}(t) - \Delta y_{sc}(t)\Delta P_b(t) \\ P_{b2}(t) = P_b(t) + \Delta P_b(t) - \Delta y_b(t)\Delta P_{sc}(t) \end{cases}$$

(13)

Indicators	Weights
Access time	0.24
Access to physical terminals	0.14
Number of accesses	0.16
Access to connection jumps	0.12
Access time	0.28
Access content similarity to the central website	0.06

Table 3: Target User Analysis Index System Table.

3.5 Model Summary

In this paper, the evaluation system of the convergence model of traditional and digital publishing is modeled and analyzed based on the Internet of Things and fuzzy control theory, and a set of evaluation indexes of the convergence model is constructed. It mainly includes digital quality evaluation indexes and target user analysis indexes. The processing of data and the selection of target users are important steps of digital publishing, and the quality and level of digital publishing products in these two steps are related to the development of digital publishing enterprises as a whole.

4 SUGGESTIONS FOR THE MARKETING INTEGRATION OF DIGITAL PUBLISHING AND TRADITIONAL PUBLISHING

4.1 Building an Industrial Model of Digital Publishing

An important factor affecting the transformation of traditional publishing to digital publishing is that the profit model is not perfect. At present, many users are used to read for free on the Internet and refuse to pay for the resources on the Internet, and this problem makes it difficult to build the industrial model of digital publishing. In order to solve this problem, we must establish the industrial model of digital publishing. One, charge for content. Second, third-party payment. Third, service charges.

4.2 Digital Construction of Digital Publishing's Special Products

In the process of transformation of traditional publishing industry to digital publishing industry, to have better development, it is necessary to build its own characteristic digital products. In the fast-paced modern life, many people learn through fragmented time, and if the traditional publishing industry only converts text into electronic form for publication, it will certainly not be able to meet the learning needs of modern people. In order to solve this problem, we must divide the market and create special products according to the needs of different

4.3 Develop Industry Standards for Digital Publishing

Industry associations should play their leading role and take the initiative to develop industry standards for digital publishing according to their own needs and those of the market. By coordinating and planning the details of each process of digital publishing and formulating the specifications of each process, the information flow of the whole market will be circulated, thus promoting the development of the industry. For enterprises transforming from traditional publishing to digital publishing, a detailed digital publishing industry standard is an important reference for them to build a digital publishing model, so that these transformers can better adapt to digital publishing.

4.4 Building a Digital Talent Team

The lack of talents is an important reason that hinders the development of digital publish industry, therefore, enterprises must improve the training mechanism and incentive mechanism for digital publishing talents to mobilize their enthusiasm for digital publishing industry. At the same time, enterprises also need to improve their own staff assessment system and improve the assessment qualification of digital editors, so as to improve the comprehensive quality of the digital talent team. Finally, enterprises must also establish a perfect talent introduction system. Screening high-quality digital talents from college graduates, stimulating the innovative development of talents, and constantly bringing new ideas and knowledge to enterprises.

5   CONCLUSION

The article constructs an evaluation index system for the marketing integration and development of digital and traditional publishing based on IoT and fuzzy control algorithm to help digital publishing enterprises that are in transition. The model is divided into two major parts. The first part is an evaluation system for data quality, and the second part is the evaluation system for the selection of target users. The quality and level of these two steps of digital publishing products are related to the development of digital publishing enterprises as a whole. The model constructed in this paper is enhanced from these two perspectives, which is of great significance in facilitating the transition from traditional publishing enterprises to digital publishing enterprises, and, also, can give a practical and referenceable index system for publishing enterprises in transition. Finally, the article puts forward suggestions for the integrated development of digital publishing and traditional publishing, including building an industrial model of digital publishing, digitally constructing special products of digital publishing, formulating industry standards of digital publishing, and building a digital talent team.

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