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Research Article

The Impact of Digital Finance on the Commercial Circulation Industry Based on IoT and Big Data

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Digital finance represented by the Internet of Things (IoT) has strong penetration and integration. The real economy has always been an important cornerstone of social and economic development. As a bridge between producers and consumers, the commercial circulation industry also plays an irreplaceable role in the healthy development of social economy. Therefore, this study is based on the Capability Maturity Model (CMM), the integration maturity is divided into four categories, and the results are qualitatively analyzed. The research results show that under the Internet of Things mode, the integration development maturity level and the integration development maturity are concentrated at a lower stage (defined level).

1. Introduction

In the overall scale of the industry, reform of the management system, diversification of circulation subjects, innovation of circulation methods, and other aspects, the added value of the commercial circulation industry has exceeded 10 trillion yuan, accounting for 13% of GDP. There are more than 5000 commodity trading markets with an annual turnover of more than 100 million yuan, and the overall annual turnover has reached 10 trillion yuan. The number of circulation entities has exceeded 66 million, and the number of employed people in the industry has reached 200 million. The contribution rate of tax revenue growth also reached 25%. There is no doubt that the trade circulation industry has become the main force and support for stable growth, structural adjustment, and people's livelihood [1]. During the 40 years of reform and opening, the commercial circulation industry has gradually been accepted by the whole society for its contribution to the social economy and its importance in the national industrial system. The circulation industry has become the foundation and leading industry of China's economy [2]. However, there are still many problems in China's commercial circulation industry, such as the task of reducing circulation costs still exists, the market concentration of the whole industry, and the scale of leading enterprises still lag far behind.

In addition, under the special background of the economic downturn and the rapid rise of IoT in recent years, the financial industry itself has encountered problems such as "breaking away from reality to emptiness." The exertion of financial functions has been disconnected from the actual demand of the real economy. The ability and level of the financial industry to provide blood transfusion for real enterprises need to be further improved [3]. On the other hand, it should be soberly recognized that the financial industry also faces some long-term cumulative problems, such as the difficulty for enterprises to obtain financing services, the high cost of capital, the nonallocation of financial resources and the actual needs of industry development, the "false to false" of capital, and the accumulation of various potential risk problems caused by idling [4, 5]. At present, China's financial industry has made great achievements in scale development, but structural problems such as the development proportion of financial institutions, the industry flow of financial resources, and the types of financial products and service modes are relatively prominent, which has damaged the role of the financial industry in China's economic growth [6–8].

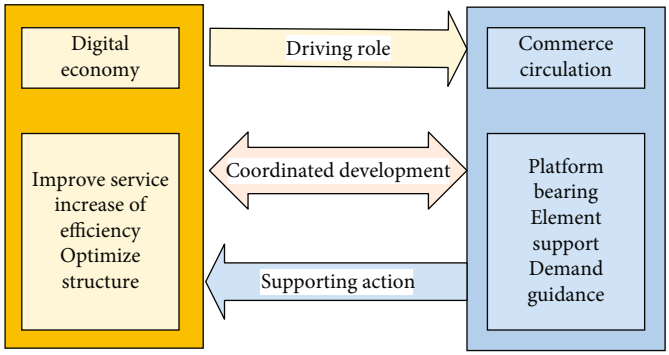

Figure 1: Coordination between digital finance and commercial circulation.

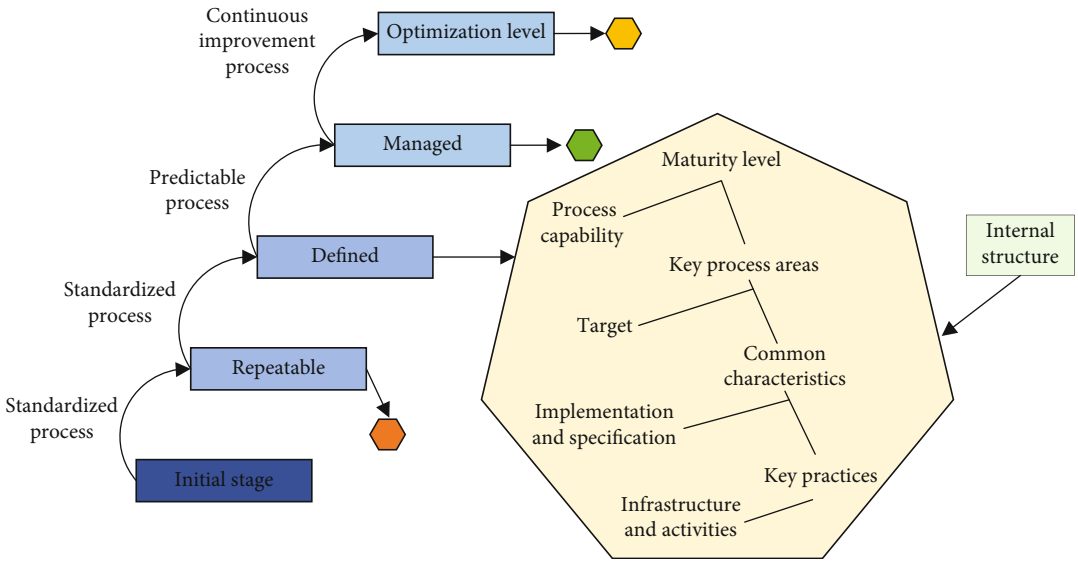

Figure 2: Digital finance CMM model and internal structure.

Table 1: Hierarchical classification and key process areas.

Grade name	Process areas at all levels	Grade characteristics
(1) Initial stage	—	Software process is characterized by disorder, even chaos
(2) Repeatable stages	Demand management	Cost, schedule, and functional characteristics
(3) Defined level	Integrated management	Tailored processes
(4) Managed level	Quantitative process management Software quality management	Collect detailed metrics
(5) Optimization level	Defect prevention Technical innovation management Process change management	—

The integration development foundation of digital finance and commercial circulation industry is the key factor affecting the maturity level. In terms of influencing factors of financial support for the trade circulation industry, the influencing factors of direct financial support and indirect financial support are different, as shown: the net sales interest rate has a greater impact on direct finance, with the impact coefficient reaching 2.69. However, the net interest rate on sales has little impact on digital finance and shows a negative correlation [9].

When analyzing the industry, the number of listed companies in the industry analyzed in many literatures is small, thus leading to the sample data volume in the available range to meet the sample analysis requirements, but still belongs to the category of small amount of data, and the scientificity of the results will grow with the development of the industry to be improved. In the analysis of the main cases, the current research program adopted the chain of substitution method and DuPont analysis which are questionable in the industry, the method itself has defects, and the results may have deviations from the actual.

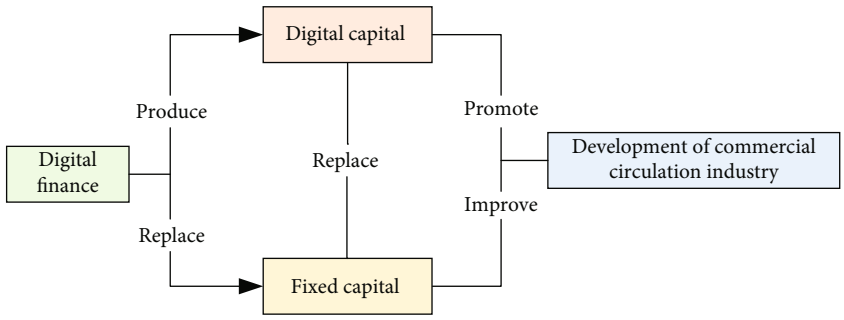

Figure 3: Model building process.

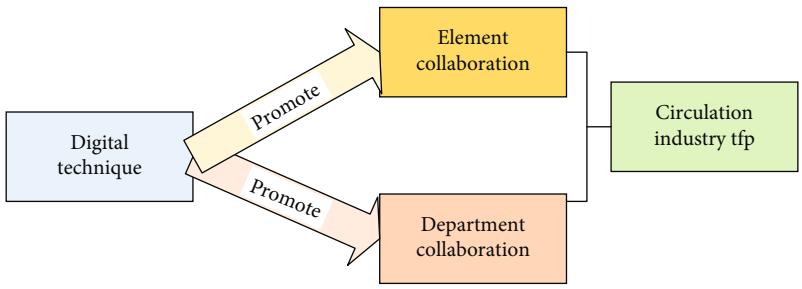

Figure 4: Penetration effect mechanism of digital finance CMM model.

Table 2: Digital financial development level indicator system.

Index	Level I indicators	Secondary indicators	Company
Level of digital finance	Financial infrastructure	Number of Internet access ports	10000
		—	10000
		Number of IPV4 addresses	10000
	Development level of digital finance industry	Total retail sales of online consumer goods	RMB100mn
		Industrial output	RMB100mn

This paper contributes as follows:

We mainly analyze and clarify the impact mechanism of the development level of digital finance on the development of commercial circulation industry under IoT.

We propose the Capability Maturity Model (CMM), which classifies integration maturity into four categories, and qualitatively analyze the results.

The results demonstrate that the level of integration development maturity, as well as the integration development maturity, is concentrated in the lower stages in the IoT model.

2. Related Works

The contribution of ICT product diffusion to economic growth mainly comes from the substitution effect [10]. Broaden the research perspective from a single country to multiple countries, or even the world, and investigate the impact of digital financial investment on the world economic recovery from 1989 to 2000. The decomposition and measurement results show that the growth of ICT investment leads the economic growth of all countries; ICT investment in all regions has increased, while the growth in developed economies and new Asian countries is more obvious [11]. It enhances the synergy of capital, labor, and other elements, reduces the phenomenon of poor resource allocation in the market, and increases the efficiency of resource allocation, which is exactly the penetration effect of ICT [12]. The pioneering research regards the penetration effect as an important feature of GPT and a phenomenon of increasing returns to scale.

[13] pointed out that the emergence of supply chain finance is due to the mismanagement of liquidity by the enterprises in the whole supply chain, which eventually leads to the liquidity problems of each enterprise making the enterprises in the whole supply chain increase their demand for funds [14]. From the perspective of cost, it is believed that reducing the cost of loans is the meaning of the existence of supply chain finance, and the authors finally put forward some strategic suggestions for the long-term development of supply chain finance from the perspective of cost. [15] argues that if information is visualized in all aspects of supply chain operations or can be truly shared in supply chain operations, the financing risk in the whole supply chain will be reduced; [16] argues that supply chain finance can improve supply chain performance and carry out controllable risk by providing buyers with longer payment terms and by providing suppliers with more convenient financing; [17] addresses that the article points out that in the process

Table 3: Comprehensive evaluation system.

Level I indicators	Secondary indicators	Third level indicators	Company
Fundamentals of digital finance	Mobile devices	Mobile phone penetration	Department/100 people
	Information network	Number of Internet domain names	10000
	Optical cable coverage	Optical cable length per unit area	km/km^2
	Broadband connection	Number of Internet broadband access ports	10000
Digital financial scale	Number of enterprises	Number of enterprises in core industries of digital finance	Individual
	Business income	Operating income of digital financial core industry	RMB100mn
	Employment level	Number of employees in core industries of digital finance	Ten thousand people
	Fixed assets investment	Fixed asset investment in digital financial core industry	RMB100mn
Digital financial innovation	R&D manpower	In high-tech industry	Person year
	R&D expenditure	Expenditure for technological transformation of high-tech industry	10000 yuan
	Patented invention	Number of effective invention patents in high-tech industry	Piece
	New products	Number of new product development projects in high-tech industry	Individual
	Mobile payment	Online mobile payment level	—
	Family life	Digital TV home penetration rate	%
	Business management	Proportion of enterprises adopting information management	%

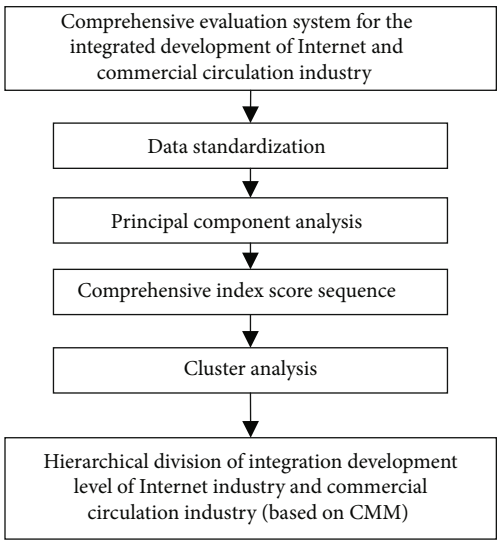

Figure 5: Digital finance and trade circulation industry in CMM model.

of supply chain operation, the management efficiency of enterprises for their own inventory and logistics transportation will have an impact on the efficiency of supply chain finance, and poor management will result in greater risks; [18] studied the background and solutions of credit risk in supply chain finance from macro, meso, and micro perspectives.

At the micro level, the computer industry's contribution to the economy from 1987 to 1994 found that computer spending has a certain correlation with the effect of economic growth and time [13–15]. In a year, the impact of computers on total factor productivity is almost zero, or even none. But in five years, the development of computer investment will double or even have a greater impact on total factor productivity. The higher the level of transportation infrastructure, the better the role of urbanization in promoting trade circulation industry. On the contrary, the lower the level of transportation infrastructure, the worse the role of urbanization [16–24].

To sum up, the IoT has a deep practical foundation in analyzing the impact of digital finance on the commercial industry.

3. CMM Model of Digital Finance and Commercial Circulation

If there is no demand or the demand shrinks, the development of the industry will slow down or even stagnate [25]. The demand for digital equipment and digital finance from the commercial circulation industry is one of the reasons for the rapid development of digital finance. At present, China's trade circulation industry is in a critical period of modernization, transformation, and upgrading, so the trade circulation industry has an urgent need for digital finance. Especially after the country proposed to build a modern circulation system and a new development pattern, the demand of the commercial circulation industry for digital finance has been further deepened.

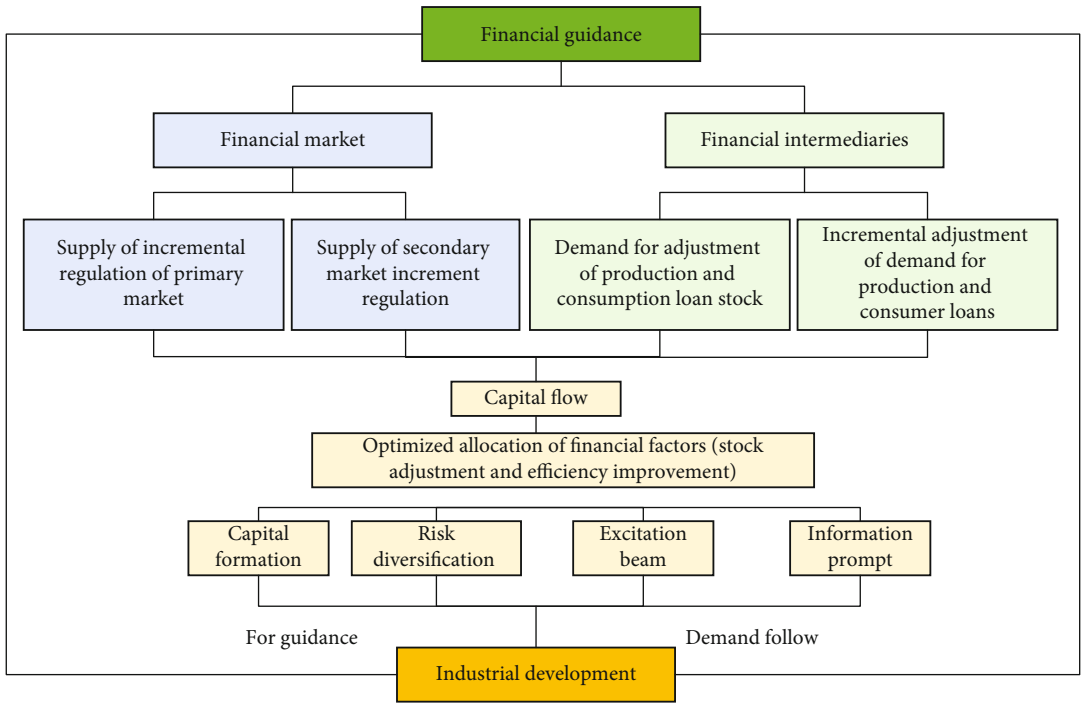

Figure 6: Coupling impact model of digital finance.

Table 4: Coupling analysis of digital finance and commercial circulation industry.

	Z score (x_1)	Z score (x_2)	Z score (x_3)	Z score (x_4)	Z score (x_5)
Z score (x_1)	1.000	0.973	0.918	0.981	0.769
Z score (x_2)	0.973	1.000	0.958	0.948	0.797
Z score (x_3)	0.918	0.958	1.000	0.928	0.735
Z score (x_4)	0.981	0.948	0.928	1.000	0.745
Z score (x_5)	0.769	0.797	0.735	0.745	1.000

Table 5: Inspection form of digital finance and commercial circulation industry coupling.

Kaiser-Meyer-Olkin's metric of sufficiency		0.708
Bartlett's sphericity test	Approximate chi-square	75.861
	df	10
	Sig	0.000

Table 6: Variance of digital finance and commercial circulation coupling.

Composition	Initial characteristic value			Extract square sum load		
	Total	% of variance	Cumulative%	Total	% of variance	Cumulative%
1	4.511	90.192	90.192	4.511	90.192	90.192
2	0.345	6.889	97.081			
3	0.099	1.989	99.069			
4	0.041	0.798	99.869			
5	0.007	0.132	100.000			

Table 7: Matrix of coupling components of digital finance and commercial circulation industry.

	Component
Z score (x_1)	0.981
Z score (x_2)	0.987
Z score (x_3)	0.959
Z score (x_4)	0.973
Z score (x_5)	0.846

The coordination relationship between the two can be summarized as shown in Figure 1.

Therefore, this paper builds a CMM model. From the structure of the model, we can see that the five levels of the CMM model represent different levels of software process capability. When the target of the corresponding level of key process areas is achieved, it is considered to have reached the level, and the public characteristics indicate the attributes of effective key process areas and key practices of the organization, as shown in Figure 2.

The goal in digital finance CMM refers to the summary of key practices in the trade circulation industry, which represents the scope and boundary, and the goal is an indicator to check whether the key process area meets the requirements, as shown in Table 1.

In the view of the Internet of Things, the CMM model uses an algorithm that can be conversely converted. Therefore, the converted HSI color space can also be accurately converted to RGB color space. When processing the conversion from HSI spatial model to RGB space, it is necessary to normalize them in their respective spaces. For the H component in different regions, different conversion equation are used, such as Equations (1)–(3).

When H is between [0°, 120°],

$$\begin{cases} B = I(1-S), \\ R = I\left[1 + \dfrac{S\cos H}{\cos(60^\circ - H)}\right], \\ G = 3I - (B+R). \end{cases} \tag{1}$$

When H is between [120°, 240°],

$$\begin{cases} R = I(1-S), \\ G = I\left[1 + \dfrac{S\cos(H-120^\circ)}{\cos(180^\circ - H)}\right], \\ B = 3I - (G+R). \end{cases} \tag{2}$$

When H is between [240°, 360°],

$$\begin{cases} G = I(1-S), \\ B = I\left[1 + \dfrac{S\cos(H-240^\circ)}{\cos(300^\circ - H)}\right], \\ R = 3I - (G+B). \end{cases} \tag{3}$$

Under the background of market economy development and sharing economy era, the development of Internet of Things technology makes the value of productive service industry increase continuously. The main content of market activities is the relationship between the supply and demand balance of products and the market connection. Although the key to the balance of the national economy is to achieve the equilibrium between the supply and demand of goods on the market, the calculation method is as follows:

$$\mu_0(t) = \frac{\sum_{i=0}^{t} ip_i}{P_0(t)}, \tag{4}$$

$$\mu_1(t) = \frac{\sum_{i=t+1}^{l-1} ip_i}{P_1(t)}, \tag{5}$$

$$\mu_T = \sum_{i=0}^{l-1} ip_i. \tag{6}$$

From this formula, we can calculate the overall variance of the coupling between digital finance and commercial circulation industry. Equations (7) and (8) are as follows:

$$\sigma_1^2 = P_0(t)[\mu_0(t) - \mu_T]^2 + P_1(t)[\mu_1(t) - \mu_T]^2, \tag{7}$$

$$\begin{aligned} \sigma_2^2 = {} & P_0(t)\sum_{i=0}^{t}\left[(i-\mu_0(t))^2\left(\frac{p_i}{P_t}\right)\right] \\ & + P_1(t)\sum_{i=t+1}^{l-1}\left[(i-\mu_1(t))^2\left(\frac{p_i}{P_1}\right)(t)\right]\sigma_T^2 = \sigma_1^2 + \sigma_2^2. \end{aligned} \tag{8}$$

However, this does not mean that China's circulation sector has no effect on the supply and demand of commodities in the market. Under the conditions of determining production and consumption, the quality of services provided by China's trade circulation industry has a great impact on the relationship between supply and demand of goods. The high-quality development of commodity economy must reasonably organize the circulation of goods. One important aspect is to solve the rationality of the commodity supply structure. Its innovation will certainly become a huge driving force to promote economic development in the future: China's commercial circulation enterprises and the intelligent development of China's commercial circulation enterprises will further reduce the production cost of commodities, so that consumers can enjoy lower prices. The model construction process is shown in Figure 3.

From the perspective of the IoT, the penetration factor collaboration of the CMM model refers to the fact that when digital finance enters the trade circulation industry as a factor resource, it makes technology, labor, and capital connect with each other to achieve a goal in a coordinated manner. Its specific performance is that digital finance can achieve internal element coordination by optimizing the element structure and promote the efficiency of trade circulation. Digital finance makes managers supplement labor and capital in a timely and appropriate manner, optimize their

Table 8: Basic correlation matrix and component matrix of integrated development of digital finance and commercial circulation industry.

	Correlation matrix					Component
	Z score (x_6)	Z score (x_7)	Z score (x_8)	Z score (x_9)	Z score (x_{10})	1
Z score (x_6)	1.000	0.742	0.743	0.678	0.685	0.827
Z score (x_7)	0.742	1.000	0.874	0.891	0.765	0.928
Z score (x_8)	0.743	0.874	1.000	0.963	0.896	0.974
Z score (x_9)	0.678	0.891	0.963	1.000	0.883	0.962
Z score (x_{10})	0.685	0.765	0.896	0.883	1.000	0.919

Table 9: Principal component analysis and calculation of digital finance and commercial circulation.

Particular year	Number of enterprises	Growth rate (%)	Investment in fixed assets (100 million yuan)	Growth rate (%)	Operating revenue (100 million yuan)	Growth rate (%)	Number of employees (10000)	Growth rate (%)
2011	39778	11.51	9816.55	45.13	93758.17	20.94	1283.92	10.22
2012	45793	15.13	10799.85	10.03	109413.11	16.71	1419.6	9.56
2013	51302	12.04	12236.75	13.31	123789.78	13.15	1374.18	-3.31
2014	56045	9.26	13196.57	7.85	140013.78	13.12	1460.88	5.94
2015	58129	3.73	15416.01	16.83	145165.97	10.12	1502.77	2.78
2016	57578	-0.96	18300.35	18.72	170734.53	10.76	1658.27	9.38
2017	57288	-0.51	21575.16	17.88	185416.03	8.61	1703.57	2.67
2018	59322	3.56	25871.18	19.92	189883.99	2.42	1686.73	-1.01
2019	61852	4.27	32221.08	20.28	206091.78	8.55	1689.69	0.19
2020	64508	4.29	35438.61	13.88	229934.64	11.58	1804.97	6.39

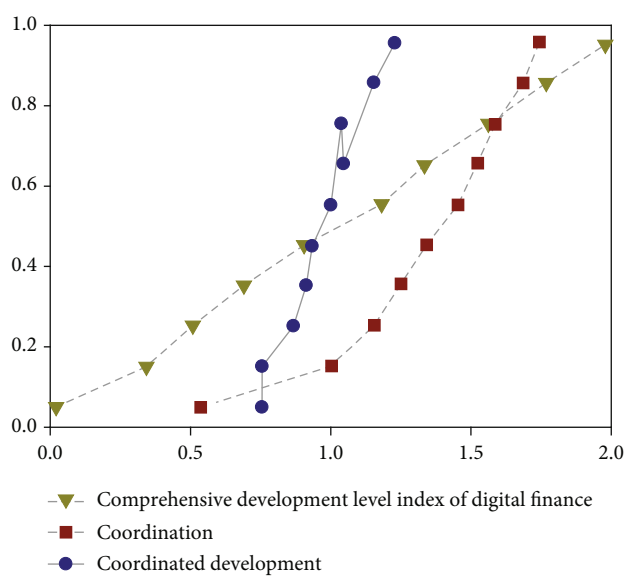

Figure 7: Development comparison of coordination between digital finance and commercial circulation industry.

composition ratio, and promote the synergy efficiency of their production factors, and As shown in Figure 4, the industry realizes industrialization by timely transferring the labor force lacking in production and operation to managers. The application of digital finance to the commercial circulation industry itself is the progress of circulation technology. Workers can improve the coordination efficiency by using corresponding technologies and equipment.

Digital finance is also conducive to optimizing the capital structure of enterprises. Digital finance divides the capital investment in the commercial circulation industry into physical fixed capital investment and network digital capital, gradually reduces the investment in fixed capital, increases the types and liquidity of capital elements, reduces the risk of physical circulation capital, and optimizes the capital structure of enterprises.

Based on this criterion, the best threshold of the CMM model is the dynamic t^* value that makes $C0$ and $C1$ get the best separation. Therefore, $\eta(t)$ is defined as the maximum decision criterion, as shown in the following equation:

$$\max_{0 \le t \le l-1} \eta(t) = \max \eta(t^*). \tag{9}$$

Using CMM model to build optimization algorithm can adaptively segment digital finance and commercial circulation industry. Its biggest advantage is that it not only improves the accuracy of the correlation between the two but also effectively avoids frequent human-computer interaction caused by manual threshold setting, providing a robust guarantee for the independence of system operation.

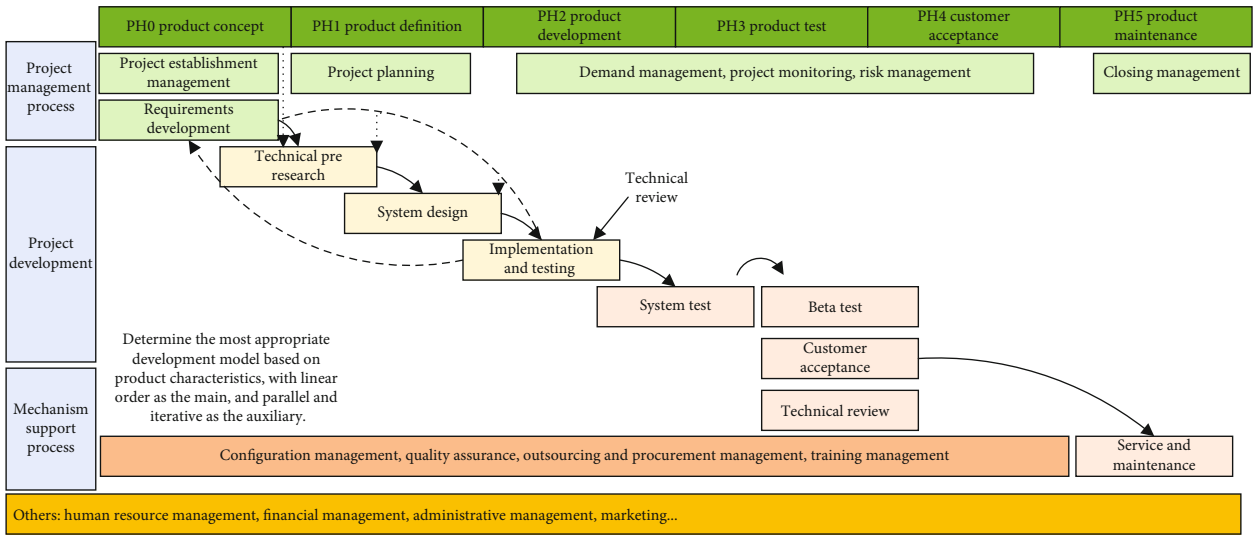

Figure 8: Optimization model of digital finance and commercial circulation coupling calculation.

Table 10: Total variance analysis of digital finance and commercial circulation industry in the perspective of the Internet of Things.

Factor	Sum of squares of rotating loads		
	Total	Variance contribution	Cumulative variance contribution
Factor 1	4.74	52.52%	52.52%
Factor 2	4.22	46.79%	99.31%

4. Methods

4.1. Design System. The most essential feature of digital finance is digitalization. The OECD generally states that the Internet, broadband networks, mobile applications, information services, and hardware form the technical basis of digital finance. In recent years, people have become increasingly dependent on digital finance. See Table 2 for the current online circulation.

4.2. Weight Determination and Measurement Results. The records of China's digital finance related development research data are not exhaustive and complete. Therefore, combined with the above composition of the digital finance development level indicator system, the number of mobile phone base stations, the number of IPV4 addresses, the number of Internet access broadband ports, and other indicators reflect the development level of digital finance infrastructure.

This paper selects 16 indicators from the four perspectives of foundation, scale, innovation, and application to establish the article's comprehensive evaluation indicator system of digital finance according to the principle of building a comprehensive indicator system. See Table 3 for details.

The industrial scale of digital finance can directly reflect the development degree of digital finance, so the industrial scale indicator is a mandatory part of comprehensive measurement, and the digital finance industry mainly refers to the electronic information manufacturing industry, software, and information technology service industry, which are two core digital industries. The consideration of these two core industries is mainly from the number of enterprises, operating income, employment level, and fixed asset investment. The data of specific measurement indicators are directly obtained by adding the data of two core industries, as shown in Figure 5.

In weight calculation, principal component analysis is mainly applied. Its principle is to find a way to transform the original variables into a set of unrelated methods that not only require reflecting the original variable information as much as possible but also achieve dimension reduction effect. Generally, when the amount of information represented is at least 80% of the original variable information, the first few largest principal components are selected to represent the original variable information. The comprehensive evaluation function of the entire indicator system can be obtained by weighting the contribution rates of the corresponding principal components.

Based on this, the original data matrix of digital finance and commercial circulation industry coupling is obtained as shown in the following equation:

$$X = \begin{bmatrix} x_{11}, & x_{12}, & \cdots x_{1P} \\ x_{21}, & x_{21}, & \cdots x_{2P} \\ x_{n1}, & x_{n1}, & \cdots x_{nP} \end{bmatrix} = \left[X_1, X_2, \cdots \cdots X_p\right]. \quad (10)$$

Wherein, Equation (11) is as follows:

$$X_i = (x_{1i}, x_{2i}, \cdots x_{ni}), \quad i = 1, 2, \cdots, p. \quad (11)$$

Table 11: Correlation load matrix.

	Factor 1	Factor 2
Technical market turnover (100 million yuan) $X9$	0.89	0.48
Resident consumption level (yuan) $X2$	0.79	0.62
Total length of automobile mail route (km) $X7$	0.79	0.62
$X1$	0.78	0.65
Added value of wholesale and retail industry (100 million yuan) $X3$	0.77	0.66
Business cost of wholesale owners (100 million yuan) $X6$	-0.73	-0.68
Main business cost of department store retail (100 million yuan) $X4$	-0.48	-0.88
Total liabilities of catering enterprises (RMB 100 million ×5	-0.64	-0.78
Internet penetration rate $X8$	0.65	0.77

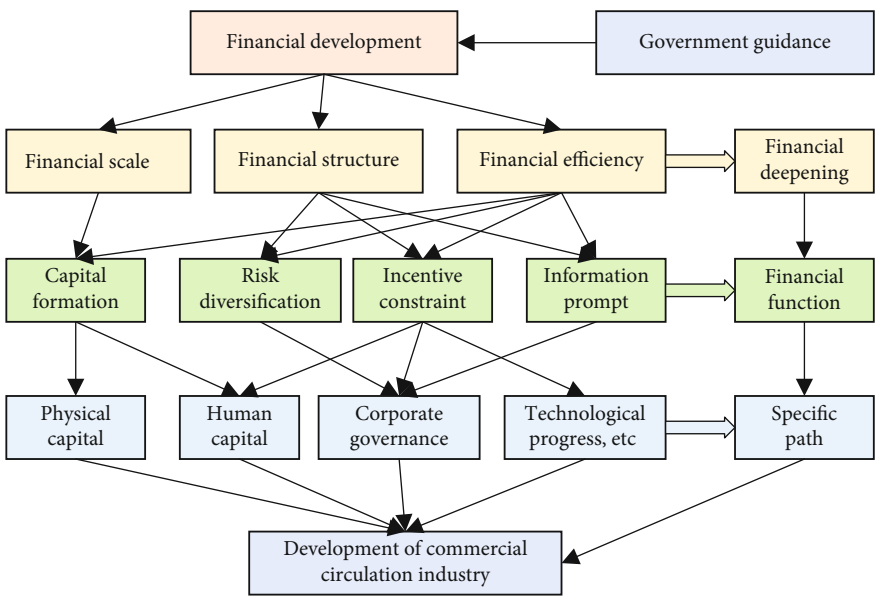

Figure 9: Coordination framework of digital finance and trade circulation in different regions.

As previously mentioned, standardization is required before the establishment of principal components, as shown in the following equation:

$$\left(z_{ij} = \frac{x_{ij} - \bar{x}_j}{\sigma_i}, \text{among}, \bar{x}_j = \frac{1}{n}\sum_{i=1}^{n} x_{ij}, \sigma_j^2 = \frac{1}{n-1}\sum_{i=1}^{n}\left(x_{ij} - \bar{x}_j\right)^2\right), \tag{12}$$

To replace the original p indicators with new indicators, the original indicator $x_1, x_2, \cdots x_p$ needs to be linearly combined; the standardized indicator $z_1, z_2, \cdots z_p$ is used to obtain the new comprehensive indicator, as shown in the following equations:

$$y_i = a_{i1}z_1 + a_{i2}z_2 + \cdots a_{ip}z_p, \quad i = 1, 2, \cdots, p, \tag{13}$$

$$a_{i1}^2 + a_{i2}^2 + \cdots a_{ip}^2 = 1, \quad i = 1, 2, \cdots, p. \tag{14}$$

After determining the principal components, the corresponding linear weighted sum is performed to obtain the comprehensive evaluation index F. The F score is used to evaluate the coupling of digital finance and commercial circulation industry, as shown in the following equation.

$$F = \frac{(\lambda_1 y_1 + \lambda_2 y_2 + \cdots + \lambda_k y_k)}{\sum_{i=1}^{p}\lambda_i}. \tag{15}$$

The final calculation model is shown in Figure 6.

5. Case Study

5.1. Correlation Analysis of Digital Finance and Commercial Circulation Industry. The evaluation of the integration environment of digital finance and commercial circulation industry mainly includes economic environment, consumption environment, sales environment, and circulation environment [26–29]. It is reflected by five indicators, namely, per capita GDP ($X1$), per capita consumption level ($X2$), and per capita communication cost ($X3$), as shown in Table 4.

Table 12: Calculation results of coordination degree between digital finance and trade circulation in different regions.

Province	Coordinated dispatching in 2011	2014 coordinated dispatching	Coordinated dispatching in 2017	Coordinated dispatching in 2020
Beijing	0.8568	0.9108	0.9388	0.9408
Tianjin	0.8255	0.8873	0.8979	0.8949
Hebei	0.8288	0.9042	0.9375	0.9378
Shanxi	0.8165	0.8893	0.9426	0.9494
Inner Mongolia	0.7394	0.9039	0.9227	0.9335
Liaoning	0.8831	0.9646	0.9586	0.9611
Jilin	0.9003	0.9384	0.9564	0.9824
Heilongjiang	0.8931	0.9759	0.9481	0.9714
Shanghai	0.8161	0.8842	0.8978	0.8969
Jiangsu	0.9989	0.9989	0.9981	0.9968
Zhejiang	0.9381	0.9631	0.9708	0.9626
Anhui	0.8228	0.9194	0.9213	0.9958
Fujian	0.9324	0.9629	0.9998	0.9939
Jiangxi	0.8859	0.9337	0.9822	0.9978
Shandong	0.9084	0.9707	0.9772	0.9815
Henan	0.8938	0.9468	0.9745	0.9832
Hubei	0.8849	0.9531	0.9729	0.9939
Hunan	0.8533	0.9323	0.9722	0.9792
Guangdong	0.9998	0.9962	0.9844	0.9716
Guangxi	0.8378	0.9088	0.9334	0.9561
Hainan	0.8224	0.8217	0.8645	0.8784
Chongqing	0.8051	0.8911	0.9569	0.9802
Sichuan	0.9719	0.9851	0.9973	0.9987
Guizhou	0.9417	0.9204	0.9654	0.9873
Yunnan	0.7879	0.8534	0.8939	0.9146
Shaanxi	0.9345	0.9479	0.9598	0.9791
Gansu	0.8671	0.9198	0.9412	0.9435
Qinghai	0.9316	0.9543	0.9425	0.9667
Ningxia	0.7588	0.8927	0.8895	0.9162
Xinjiang	0.7145	0.7808	0.8176	0.8501

The KMO value was $0.709 > 0.6$, indicating that the selected indicators were suitable for principal component analysis. The Bartlett sphericity test results were good and significant. The cumulative variance of the first indicator variable reached 90.19%. Principal component analysis can be carried out, as shown in Tables 5–7.

The basic indicators of software include the capacity of mobile telephone switch per 100 people, the Internet broadband access port per 100 people, and the ownership of CN domain names per 10000 people. The hardware basis starts with the use of terminals, including the number of computers per 100 households and the ownership of mobile phones per 100 households. The results are analyzed using SPSS, as shown in Table 8.

The correlation matrix shows that the five indicators have strong correlation and can explain the same principal component together. The KMO ($0.821 > 0.6$) and Bartlett test results show that the test indicators constitute a multivariate normal distribution with strong significance. The cumulative variance of the first indicator reaches 85.14%, indicating that most of the information can be covered and principal component analysis can be conducted.

5.2. Principal Component Analysis. According to statistical data, from 2011 to 2020, the number of core digital financial enterprises in China increased from 39777 to 64507, with an obvious overall growth trend, but the growth rate slowed down significantly, from 11.5% in 2011 to 4.29% in 2020. Even in 2016 and 2017, there was a small reverse growth. During this period, China also invested a large amount of fixed assets in the digital financial industry. In 2011, the fixed asset investment in China's digital financial industry was only 981.654 billion yuan. However, the growth rate of operating income in 2011–2018 was obviously declining, and it did not rise again until the popularity of digital finance increased. In 2011, the number of employed people

in the digital finance industry was 12839100, and in 2020, the number of employed people rose to 18.0496 million, expanding the number of employed people by 5.2105 million, but the growth rate has no obvious regularity. See Table 9 and Figures 7 and 8 for details.

At the same time, in Bartlett's sphericity test value, it is found that the square value of digital finance and trade circulation is 575.07, which is far greater than $(36) = 50.99$ when the confidence level is 0.05. This shows that the possibility that the coefficient matrix of the original hypothetical variable X is the unit matrix is zero. These two detection methods both indicate that the original variable X found has a common factor, which can be processed by factor analysis, as shown in Table 10.

It can be seen from this table that there are only two factors, and the corresponding characteristic values of these two factors are 4.73 and 4.21, which is the basis for the subsequent measurement of commercial circulation efficiency. The contribution degree of variance reflects the extent to which these two factors explain the overall variance. The two factors can explain the variance of 99.30% of the initial variables. The load matrix is shown in Table 11.

The coordination between the two has risen to 0.9-1, indicating that digital finance and trade circulation have begun to show an obvious interaction. From the perspective of coordinated development, in 2012 and 2013, the coordinated development of digital finance and commercial circulation was 0.5121 and 0.5859, respectively, indicating that they have entered the primary coordination stage. In 2014 and 2015, the coordinated development reached 0.6342 and 0.6818, entering a good coordination stage, and the coordination between the two remained above 0.9, still showing an obvious interaction relationship. In 2016 and 2017, the coordinated development degree rose to 0.7373 and 0.7727, but it is still in a good coordination stage.

From the perspective of space, although the coordination between digital finance and trade circulation in various provinces and cities is strong, there are still some differences between regions. In terms of large regions, it is shown as the eastern region>the central region>the western region. In terms of provinces, the coordination degree is relatively high mainly in Jiangsu, Guangdong, Zhejiang, Shanghai, and other places along the east coast. The coordination degree of these provinces and cities is basically above 0.95, and the coordination degree is very close to 1.0, as shown in Figure 9 and Table 12.

However, the degree of coordination can only reflect the strength of the relationship between digital finance and commercial circulation; not both can reflect the level of development. For example, from the chart information, we can see that the coordination degree of Gansu, Qinghai, and Ningxia has reached the level of more than 0.9.

6. Conclusion

Taking the evaluation of the integration of digital finance and trade circulation industry as the research goal, it summarizes the development status of regional provinces and cities' digital finance and trade circulation industry and selects comprehensive evaluation analysis and econometric analysis tools for empirical research. The experimental results prove that, from the overall perspective, the coordinated development of China's digital finance and trade circulation in 2011-2020 has a significant positive spatial correlation, but from the size of the Moran index, the intensity of this correlation is not particularly high at present. From a local perspective, the eastern coastal areas show high concentration, forming a diffusion effect region.

Data Availability

The experimental data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declared that they have no conflicts of interest regarding this work.

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