

Study on the Impact of Digital Transformation on the Financial Performance of Publishing Enterprises

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Abstract: The digital transformation and upgrading of China's publishing enterprises has been promoted for many years, and its ability to promote the financial performance of publishing enterprises deserves attention. Based on the 2010-2022 data of listed publishing enterprises in China, this paper adopts the text mining method to extract the keywords of "digital transformation of publishing enterprises" from the annual reports of the companies, portrays the level of digital transformation of the publishing enterprises, and empirically examines the impact of digital transformation on the financial performance of the publishing enterprises, as well as the mediating effects of production and operation costs and management efficiency. The study found that digital transformation can significantly improve the financial performance of publishing enterprises; digital transformation mainly promotes the improvement of financial performance of the publishing industry by reducing the production and operation costs; digital transformation does not have a significant effect on the improvement of financial performance in non-state-owned enterprises, large-scale enterprises, while state-owned enterprises, small and medium-sized enterprises embody more obvious.

Keyword: Digital transformation; Financial performance; Publishing companies;

1 Introduction

At present, the world's century-old changes are accelerating, the new round of scientific and technological revolution and industrial changes are developing deeply, and the traditional industries are accelerating their transformation and upgrading in the direction of intelligence, greening and integration. In the tide of digital transformation, the publishing industry should be considered a pioneer. As early as the beginning of this century, some publishing companies have begun to intervene in the digital transformation attempts and exploration. Of course, there are also enterprises do not dare to turn, unwilling to turn the reality of the situation, always hovering, holding wait-and-see state. A little analysis, can not be found, although there are many factors affecting the willingness to transform, but the most fundamental or digital transformation can bring real economic benefits to the publishing industry, or digital transformation in the end can not promote the financial performance of publishing enterprises. Therefore, it is very necessary to explore the intrinsic mechanism and process of digital transformation on the financial performance of publishing enterprises.

For the digital transformation of publishing enterprises, existing research mainly focuses on the transformation dilemma, path exploration and development direction. Hill^[1] believes that the commercial driving factors behind the digital transformation of book publishing enterprises

include the highly dynamic market for e-books and other digital products, the pressure to reduce costs, and the shrinking ROI range of technology investment; Mangani and Tarrini^[2] analyzed the diversification strategies of 2838 digital editors in Italy between 1995 and 2014, as well as the impact of diversification on survival probability. Empirical research found that if the publishing industry can undergo digital transformation, the degree of specialization and diversification of publishing will be higher, and the market share will also correspondingly increase. For the financial performance of publishing enterprises, most scholars study and analyze the four aspects of profitability, solvency, growth, and operating ability, Jin Yingwei and Zhang Min^[3] use financial performance evaluation model to assess the financial status of listed publishing enterprises, and analyze the weaknesses and potential development space in the process of enterprise development. However, the research on the impact of digital transformation on company financial performance is inconclusive. Some studies show that digital transformation has a facilitating effect on corporate financial performance, such as Ding Chenjing^[4] through empirical research found that the higher the degree of enterprise digitization, the more pronounced the level of corporate financial performance; there are also some studies do not agree with this point of view, such as Liang Lina and Zhang Guoqiang^[5] through the construction of OLS model and threshold model, empirical evidence found that the digital transformation of the enterprise short-term financial performance has a significant negative impact, and the long-term financial performance of enterprises with the existence of a "spindle-shaped distribution". There is a "U"-shaped relationship with the long-term financial performance of enterprises.

In summary, academic research on digital transformation of the publishing industry focuses on the theoretical level, and few scholars have systematically and quantitatively explored the impact mechanism of digital transformation on the financial performance of the publishing industry from the theoretical perspective. Based on this, this paper takes A-share listed publishing enterprises in China from 2010 to 2022 as the research sample, applies the text mining method, extracts the keywords of digital transformation disclosed in the annual reports of the enterprises, measures the level of digital transformation of the publishing enterprises, and empirically analyzes the channel mechanism and effect of digital transformation on the financial performance of the publishing enterprises.

2 Rationale and assumptions

Digital transformation is different from data conversion and digital upgrading, but built on the basis of the two higher-level transformation, that is, driven by technology, environment and other factors, the enterprise to carry out the reform and upgrading of the organizational design, business model, business processes is to obtain a better competitive advantage and improve the performance of enterprises in the process^[6].

2.1 Impact of digital transformation on the financial performance of publishing companies

Digital transformation is no longer a purely technical issue, but a strategy of all-factor digital transformation, upgrading, reshaping and reengineering based on upstream and downstream of the industrial chain, supported and led by a new generation of digital technologies^[7]. The financial performance of an enterprise will affect the implementation and execution of its

strategy, thus contributing to the final business performance. Financial performance can comprehensively reflect cost control, asset utilization management, deployment of capital sources, and return on shareholders' equity. Publishing companies can use digitalization to transform the traditional publishing industry "production before sales" into "sales-oriented production", or even production and sales as a whole. This can not only promote their own productivity progress, realize technological upgrading, but also significantly reduce inventory costs and opportunity costs, thus creating better economic benefits for the enterprise. Based on this, the first research hypothesis is proposed.

Hypothesis 1: Digital transformation has a positive effect on the financial performance of publishing companies

2.2 Analysis of the mechanism of digital transformation affecting the financial performance of publishing enterprises

The production and operating costs of a publication include production costs, selling expenses and administrative expenses. The production cost of a publishing company can be divided into two kinds, one is variable cost and the other is fixed cost, in which the variable cost includes paper material cost, printing cost, binding cost and royalty, and the fixed cost includes one-time manuscript fee, editing fee, plate making fee, typesetting fee and so on. Production costs account for a large proportion of the total cost of publications. In the current micro-profit era, a 10% saving in production costs may result in a 100% increase in profit^[8]. Digital transformation reduces the production cost of publishing enterprises by empowering rationalization of resource allocation and controllable production process. In addition to production costs, digital transformation also profoundly affects the selling and administrative costs of publishing enterprises. This is mainly reflected in the degree of impact on content delivery. Delivering content in the form of electronic documents rather than books. Locking content into physical books, which traditionally required storing books in warehouses, shipping them to bookstores and wholesalers, accepting returns of unsold books, and ultimately documenting an oversupply of books, may no longer be necessary through the digital transformation. That is, publishers will make content available directly to their users through their own websites or online bookstores, the costs of producing, storing, and transporting physical books will disappear, and the problem of returns will no longer exist. Based on this, a second research hypothesis is proposed.

Hypothesis 2: Digital transformation in the publishing industry has a positive effect on its financial performance by reducing production and operating costs

With the wide application of digital communication technology, the entire editing process, costing of books, scheduling, dynamic monitoring of inventory, and analysis of business conditions can be networked and managed. The company takes advantage of the digital transformation and introduces an automated office management system, which makes communication between departments within the company more convenient and strengthens the degree of collaboration between departments within the company through networked management. The rapid acquisition and processing of information reduces the cost of information acquisition and the time of information flow, and enhances the management efficiency of the company. Based on this, the third research hypothesis is proposed.

Hypothesis 3: Digital transformation of publishing companies has a positive effect on their financial performance by improving management efficiency

3 Variable Description and Modeling

3.1 Data sources

This paper selects the data of A-share listed publishing enterprises from 2010 to 2022 as the research sample to empirically analyze the role of digital transformation on the financial performance of publishing enterprises and its effect mechanism. According to the Classification Standard for Listed Companies issued by the China Securities Regulatory Commission, there are currently 29 listed companies in the news publishing industry. The data on digital transformation come from the annual reports of listed publishing enterprises downloaded from Juchao Information Network, and other data come from the database of Guotai'an. In addition, in order to ensure the reliability of the results, this paper Winsorize all continuous variables with 1% quantile and 99% quantile.

3.2 Selection of variables

(1) Explained variable: corporate financial performance (ROA), Expressed as net profit as a percentage of total assets. In addition, this paper uses return on equity (ROE) and earnings per share (EPS) for stability test.

(2) Explanatory variable: digital transformation (DIGI). Digital transformation is a complex multidimensional phenomenon involving multiple dimensions such as product, service, process, model and organization. Therefore, the types of digital transformation, specifically, can be divided into product digital transformation, service digital transformation, process digital transformation, model digital transformation and organizational digital transformation^[9]. All these digital transformations rely on the support of digital technology. Therefore, in this paper, in the structured hierarchy of digital transformation, the two levels of "types of digital transformation" and "basic supporting technologies" are defined.

At present, China is in the stage of accelerated development of digitization, the academic community has not yet reached an agreement on the measurement of the degree of digital transformation, this paper refers to the research of Wu Fei^[10], the use of text mining for the extraction of keywords involved in digital transformation in the annual reports of listed companies. Among them, in the determination of the characteristic words of digital transformation of publishing enterprises, this paper firstly refers to the Nomenclature of Editing and Publishing (published by the National Science and Technology Nomenclature Validation Committee), the Fundamentals of Digital Publishing (Office of Publishing Qualification Examination of the State Publishing and Publishing Administration), the Opinions on Promoting the Implementation of the National Cultural Digitization Strategy, Annual Performance Data Report of Listed Companies in Press and Publishing, as well as a number of other academic writings, research reports, etc., to summarize and organize specific keywords about digital transformation. On this basis, the structured classification (i.e., "type of digital transformation" and "basic support technology") is carried out according to the aforementioned analysis, forming the feature word map in Figure 1. Then, Python software is used to crawl the annual reports of listed publishing enterprises and convert them into text format to form a data pool, search, match and count the word frequencies according to the feature words in Fig. 1, and then classify and summarize the word frequencies of each category to form the final total word frequencies, so as to construct the index system of digital transformation of publishing enterprises. Finally, the

total word frequency of digital transformation is added to 1, and then after the logarithmization process, the core explanatory variables of this thesis are finally determined.

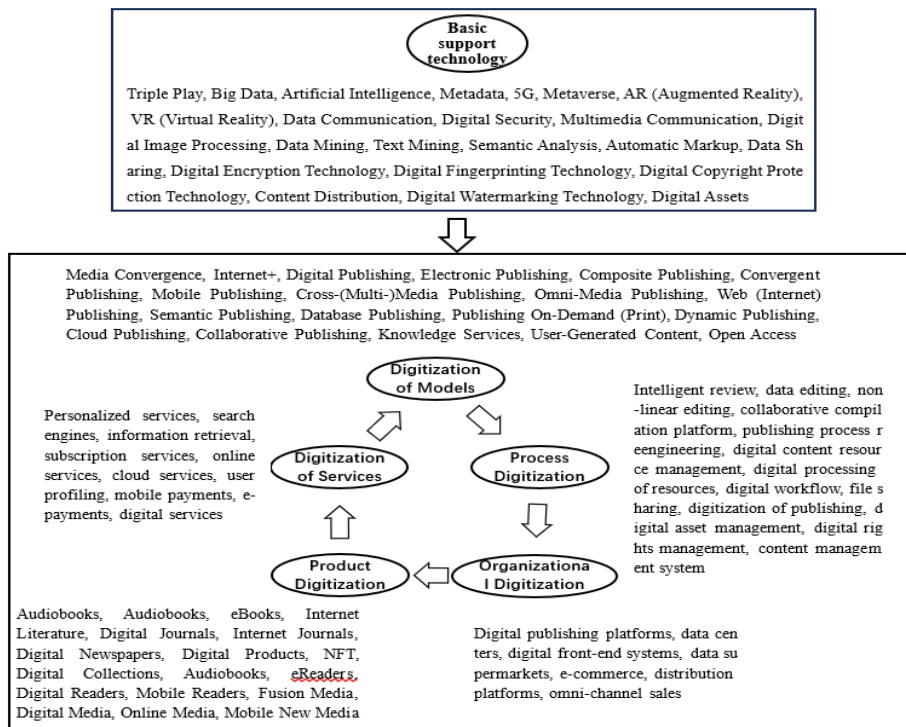


Fig.1. Structured feature word mapping for digital transformation in publishing companies

(3) Mediating variables. Production and operating costs are measured by the sales (operating) cost rate, i.e. (main operating costs + selling expenses + administrative expenses)/operating income; this paper refers to the research of existing scholars^[11], and uses the management and sales expense rate to measure the management efficiency of the enterprise, i.e. (selling expenses + administrative expenses)/main operating income, in which the management and sales expense rate is inversely proportional to the management efficiency.

(4) Control variables. Based on the existing research results, this paper proposes a set of control variables that may have an impact on the company's financial performance: enterprise size (Size), the natural logarithm of the total assets of the enterprise; the age of the enterprise (Age), Ln(the current year - the year of establishment +1); liquid assets ratio (Liquid), the proportion of liquid assets to total assets; financial leverage (Lev), the proportion of total liabilities to total assets; total assets growth rate (Growth), (total assets at the end of the current period - total assets at the end of the previous period) / total assets at the end of the previous period; cash flow strength (Cash), (cash flow strength). total assets; total assets growth rate (Growth), (total assets at the end of the current period - total assets at the end of the previous period)/total assets at the end of the previous period; cash flow intensity (Cash), cash and its cash equivalents accounted for the proportion of total assets; the number of executives (Tmnum), the total number of senior executives as disclosed in the annual report; the two positions in one (Dual), the chairman and

general manager of the two positions in one takes one. Otherwise, take 0.

3.3 Model construction

The article sets up model (1) to test whether digital transformation has an impact on the financial performance of publishing firms:

$$ROA_{i,t} = \alpha_0 + \alpha_1 DIGI_{i,t} + \sum Control_{i,t} \theta + \lambda_i + \mu_i + \varepsilon_{i,t} \quad (1)$$

Where ROA is the financial performance; DIGI is the digital transformation index of publishing enterprises, which is the core explanatory variable of this paper; Control is the control variable; λ_i is the year fixed effect, μ_i is the enterprise fixed effect, $\varepsilon_{i,t}$ is the random error, t denotes the time dimension and i denotes the enterprise dimension.

In order to test the mechanism path of digital transformation of publishing enterprises affecting financial performance, this paper carries out the mechanism identification test with the help of the mediation effect model of Wen Zhonglin et al^[12], and establishes the mediation test model (2)~(3) on the basis of model (1):

$$Mediator_{i,t} = \omega_0 + \omega_1 DIGI_{i,t} + \sum Control_{i,t} \gamma + \lambda_i + \mu_i + \varepsilon_{i,t} \quad (2)$$

$$ROA_{i,t} = \varphi_0 + \varphi_1 DIGI_{i,t} + \varphi_2 Mediator_{i,t} + \sum Control_{i,t} \delta + \lambda_i + \mu_i + \varepsilon_{i,t} \quad (3)$$

In this case, the explanatory and control variables are the same as in model (1), and Mediator is the mediating variable, which are the cost of production and operation (Cost) and managerial efficiency (Manage), respectively.

4 Empirical results and analysis

4.1 Descriptive statistics

As can be seen from Table 1, the maximum value of the explanatory variable financial performance is 0.184, the minimum value is -0.273, and the average value is 0.0550, indicating that there is a significant difference in the financial performance of different publishing listed enterprises. The maximum value of the core explanatory variable digital transformation of publishing enterprises is 5.938, the minimum value is 0, and the standard deviation is 1.039, indicating that there is a significant difference in the level of digital transformation of publishing enterprises; from the minimum value, it can be found that there are a number of publishing enterprises that have not carried out digital transformation.

Table 1. Variable descriptive statistics

VARIABLE	sample size	average value	upper quartile	standard deviation	minimum value	maximum values
ROA	246	0.0550	0.0680	0.0620	-0.273	0.184
DIGI	246	3.356	3.526	1.039	0	5.938
Size	246	22.46	22.41	0.932	19.89	24.08
Age	246	17.32	17	7.207	4	33
Liquid	246	0.634	0.649	0.168	0.266	0.944

Lev	246	0.336	0.333	0.122	0.0820	0.726
Growth	245	0.172	0.0810	0.516	-0.294	4.194
Cash	246	0.279	0.249	0.147	0.0650	0.662
Tmnum	246	5.776	6	1.576	3	9
Dual	246	0.0810	0	0.274	0	1
Cost	245	0.900	0.900	0.0700	0.690	1.120
Manage	245	0.220	0.210	0.100	0.0600	0.930

4.2 Benchmark regression

The results of the regression test of the impact of digital transformation on the financial performance of publishing firms are shown in Table 2. Among them, column (1) is the regression result without adding control variables and controlling only for year and individual fixed effects, digital transformation (DIGI) is significantly positively related to financial performance and significant at the 1% level. Column (2) shows the regression results with all control variables added. At this point, the regression coefficient of digital transformation (DIGI) is reduced, which may be due to the fact that some of the factors affecting financial performance are absorbed after the inclusion of control variables, but it does not affect the positive relationship between digital transformation and financial performance of publishing enterprises, which is still significant at the 5% level, further suggesting that digital transformation can promote publishing enterprises to obtain higher financial performance. Thus, hypothesis 1 of this paper is supported by empirical evidence.

Table 2. Regression results of the impact of digital transformation on the financial performance of publishing companies

VARIABLES	(1)	(2)
	ROA	ROA
DIGI	0.021*** (0.005)	0.017** (0.006)
Controls	YES	YES
Company & Year	YES	YES
_cons	0.040** (0.019)	0.453 (0.385)
N	246.000	245.000
r ²	0.198	0.271
r ² _a	0.037	0.088
F	3.876	3.454

Note: *, **, *** denote at $p < 0.1$, $p < 0.05$, $p < 0.01$, respectively, with standard error in parentheses, same below.

4.3 Robustness Tests

In order to test the robustness and reliability of the regression results, financial performance is replaced with return on equity (ROE) and earnings per share (EPS), respectively, and the regression results are shown in Table 3. The regression coefficients in column (1) and column (2) of Table 3, which adds control variables, are significantly positive at the 1% and 10% levels, respectively; the results in columns (3) and (4) show that digital transformation (DIGI) and earnings per share (EPS) are also significantly positively correlated at the 1% level, which

suggests that the driving effect of digital transformation on the financial performance of publishing companies is relatively robust.

Table 3. Robustness analysis results

VARIABLES	(1)	(2)	(3)	(4)
	ROE	ROE	EPS	EPS
DIGI	0.033*** (0.008)	0.019* (0.010)	0.116*** (0.027)	0.085*** (0.032)
Controls	YES	YES	YES	YES
Company & Year	YES	YES	YES	YES
_cons	0.024 (0.032)	-0.454 (0.659)	0.184* (0.097)	1.672 (1.956)
N	245.000	244.000	246.000	245.000
r2	0.186	0.281	0.137	0.177
r2_a	0.022	0.099	-0.036	-0.029
F	3.577	3.610	2.495	2.000

4.4 Heterogeneity test

Since the different nature of property rights and size of enterprises may have different degrees of influence on their financial performance, this paper carries out group regression according to the nature of property rights and size of listed publishing enterprises respectively. First, the sample is divided into state-owned publishing enterprises and non-state-owned publishing enterprises according to the nature of property rights. As can be seen from columns (1) and (2) of Table 4, the impact of digital transformation undertaken by state-owned publishing enterprises on their financial performance is more significant. The possible reason for this is that state-owned enterprises are generally more aware of their social responsibility, and when the government puts forward the goal of digital transformation, they will be more proactive in promoting it and will be able to obtain more resources to support it. Then, enterprises are categorized into SMEs and large enterprises according to the average level of their total assets. As can be seen from columns (3) and (4), small and medium-sized publishing firms contribute more significantly to their financial performance. The possible reasons for this are that small and medium-sized are generally small in size, with simple organizational structure, fewer management levels, relatively low management costs, and flexible and resilient means of operation, so they are more advantageous in carrying out digital transformation, and the promotion of the enterprise's financial performance is more obvious.

Table 4. Results of heterogeneity analysis

VARIABLES	(1)	(2)	(3)	(4)
	government owned	non- municipal	medium-sized	mega
	ROA	ROA	ROA	ROA

DIGI	0.014** (0.007)	-0.075 (0.105)	0.031*** (0.009)	0.005 (0.010)
Controls	YES	YES	YES	YES
Company &Year	YES	YES	YES	YES
_cons	0.141 (0.383)	2.852 (4.228)	0.620 (0.848)	-3.401** (1.319)
N	209.000	36.000	150.000	95.000
r ²	0.339	0.859	0.335	0.650
r ² _a	0.171	0.451	0.065	0.469
F	4.050	2.883	2.539	5.480

4.5 Impact pathway analysis

In order to deeply explore the mechanism black box of production and operation cost and management efficiency in digital transformation and financial performance of publishing enterprises, this paper empirically tests its mechanism of action by using the mediation effect model. When testing the mediation effect, the most common method is stepwise regression because it can clearly show the mechanism of the mediation effect, so this paper utilizes the stepwise regression method to validate it and uses the Sobel test to further corroborate it. Table 5 shows the results of the mediation test for production and operation costs and management efficiency, where columns (1) and (2) are the results of the mediation effect test for production and operation costs. From column (1), it can be seen that the coefficient of digital transformation (DIGI) is significantly negative at the 1% level, indicating that the digital transformation of publishing enterprises can significantly reduce the production and operation costs of enterprises; column (2) shows that the reduction of production and operation costs can significantly promote the improvement of financial performance. The combination of the results in columns (1) and (2) shows that digital transformation promotes the improvement of publishing enterprises' financial performance through the reduction of production and operation costs, which, coupled with the insignificant coefficient of the degree of digital transformation of publishing enterprises (DIGI), indicates that the production and operation costs play a fully mediating role. Subsequently, this paper further adopts the Sobel test and obtains a Z-statistic value of 4.82, which is significant at the 1% level, and Hypothesis 2 is verified, i.e., the digital transformation of publishing enterprises improves the financial performance of enterprises through the reduction of generating and operating costs.

Columns (3) and (4) show the results of the mediation effect test for management efficiency. Column (3) shows that the digital transformation of publishing enterprises (DIGI) is negatively correlated with the management sales expense ratio, but the statistical test is not significant enough to determine whether the mediating effect exists. Therefore, this paper conducted a Sobel test, and its test value is 1.203, which does not exceed the critical value, indicating that management efficiency did not pass the mediation effect test. It may be because the factors involving management efficiency in publishing enterprises are more numerous and complex, and do not reflect the changes brought about by digital transformation in the short term.

Table 5. Results of mediation tests on production and operating costs and management efficiency

VARIABLES	(1)	(2)	(3)	(4)
	Cost	ROA	Manage	ROA
DIGI	-0.032*** (0.006)	-0.006 (0.005)	-0.008 (0.006)	0.015** (0.006)
Cost		-0.708*** (0.054)		
Manage				-0.186** (0.075)
Controls	YES	YES	YES	YES
Company &Year	YES	YES	YES	YES
_cons	1.924*** (0.372)	1.816*** (0.300)	1.317*** (0.363)	0.699* (0.393)
Sobel Inspection Value		4.82		1.203
N	245.000	245.000	245.000	245.000
r2	0.350	0.613	0.215	0.294
r2_a	0.187	0.513	0.018	0.112
F	5.006	13.949	2.548	3.665

5 Conclusions and recommendations

5.1 Conclusion

This paper takes China's A-share listed publishing enterprises as the research sample, and empirically examines the impact of publishing enterprises' digital transformation on financial performance by constructing publishing enterprises' digital transformation indexes using the text mining method, and mainly obtains the following research conclusions:(1) Digital transformation has a positive effect on publishing enterprises' financial performance. (2) Compared with other types of digital transformation, the effect of mode digital transformation and organizational digital transformation on promoting enterprise financial performance is more obvious. (3) In terms of the mechanism of action, the digital transformation of publishing enterprises brings economic benefits and enhances financial performance by reducing production and operation costs, which have a fully mediating effect; however, the path of management efficiency has not been verified. It further indicates that the digital transformation of publishing enterprises makes the effect of production and operation cost reduction more obvious, while the effect of management efficiency may need a longer period of time to be verified. (4) There is heterogeneity in the impact of digital transformation of publishing enterprises on financial performance; in non-state-owned enterprises, large enterprises and primary transformation enterprises, digital transformation does not have a significant effect on financial performance, while in state-owned enterprises, small and medium-sized enterprises and deeply transformed enterprises, the promotion effect is more significant.

5.2 Recommendations

First, improve the financing environment for digital transformation and ease the financing constraints of publishing enterprises. Publishing enterprises due to light assets, heavy creativity and other characteristics, there is a general problem of financing difficult, expensive financing, so, whether it is for the need to survive and develop the growth of enterprises, or the need to further expand the scale of the maturity of the enterprise, the formation of a certain financing constraints, which is also most of the publishing enterprises "do not dare to turn, unwilling to turn, will not turn This is also one of the real problems that most publishing enterprises are "afraid to turn, unwilling to turn, unable to turn". The government should effectively consider the publishing enterprises in the digital transformation of the constraints of these realities, standardize the digital transformation financing environment, the introduction of tax, financing-related support policies, and tax, business, financial institutions and other parties to interact, so as to reduce the enterprise to carry out the digital transformation of the resources faced by the predicament. At the same time, using the advantages of the relative flexibility of digital finance, to establish a digital cultural financial system that can meet the financing needs of different periods, different scales and different types of publishing enterprises, to create a diversified and personalized digital financial products that are suitable for the specific needs of publishing enterprises and risk-controllable, so as to boost the publishing enterprises out of the digital transformation with high-quality inclusive financial services^[13].

Second, seize the opportunity of digital transformation, and clarify the strategic positioning of digital transformation. Digital transformation strategy is to integrate the entire coordination, prioritization, and implementation of digital transformations within a firm^[14], Publishing enterprises should actively comply with the trend of rapid development of digital technology. From the perspective of the practice of the development of the publishing industry, the original intention and mission of the digital strategy of the publishing industry is to realize the release of value, value creation, value-added, value chain reshaping. In this process, digital technology plays a key role. The core of the publishing industry's digital strategy lies in the use of digital, networked and intelligent methods for internal process reengineering and external product (service) upgrading, thus expanding the value of traditional processes, products and channels and further releasing their potential. In this sense, the digital strategy of the publishing industry is to digitize all the ways of thinking, behavioral patterns, workflows, work platforms, and organizational structures of traditional publishing units and publishers, so that they can become technically an entity in the digital environment and organizationally a virtual entity^[15]. Different industries and types of enterprises have different focuses and paths for digital transformation. Enterprises should define the strategic positioning of digital transformation that suits them according to the characteristics of their own industry and business development needs.

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