Research on the Construction and Evolutionary Path of the Innovation Ecosystem for Copyright Trading of Network Information Resources (Post-print)

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Abstract

[Purpose/Significance] Advancing online copyright trading in the new context can facilitate value creation and value transformation of information resources. Constructing an innovation ecosystem for online information resource copyright trading and exploring its evolution path is conducive to revealing the growth patterns of online copyright trading and guiding the sustainable development of the online copyright industry.

[Method/Process] Based on dissipative structure theory and according to the core elements and processes of online information resource copyright trading, this study constructs an innovation ecosystem for online copyright trading, explores the evolution path of system innovation, and calculates the evolution stage of China's online copyright industry development.

[Results/Conclusion] In the innovation ecosystem for online information resource copyright trading, the quantitative and qualitative changes of innovation actors, along with real-time information transfer, material cycling, and energy flow with innovation elements such as law, culture, technology, and innovation investment, drive system evolution and achieve three major innovation effects: online information resource innovation, copyright business operation innovation, and copyright trading service innovation. China's online copyright industry is in a rapid expansion phase. It is recommended to support diversified entry of actors, improve legal policies, enhance copyright literacy, apply advanced technology, and increase innovation investment to bolster the robust development of online copyright trading.

Full Text

Abstract

[**Purpose/Significance**] Promoting online copyright trading under the new situation can accelerate the value creation and transformation of information resources. Constructing an innovation ecosystem for network information resource copyright transactions and exploring its evolution path is conducive to revealing the growth patterns of online copyright trading and guiding the sustainable development of the online copyright industry. [**Method/Process**] Based on dissipative structure theory and according to the core elements and processes of network information resource copyright transactions, this study constructs an innovation ecosystem for online copyright trading, explores the evolution path of system innovation, and calculates the evolutionary stage of China's online copyright industry development. [**Result/Conclusion**] In the network information resource copyright trading innovation ecosystem, the quantitative and qualitative changes of innovation subjects, together with the real-time information transmission, material circulation, and energy flow among innovation elements such as law, culture, technology, and innovation input, drive system evolution and achieve three major innovation effects: network information resource innovation, copyright operation activity innovation, and copyright trading service innovation. China's online copyright industry is in a period of rapid expansion. It is recommended to diversify participating subjects, improve legal policies, enhance copyright literacy, apply advanced technologies, and increase innovation input to support the steady development of online copyright trading.

Keywords: network information resources; copyright transaction; innovation ecosystem; dissipative structure; copyright operation

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Introduction

In recent years, with the rapid advancement of network information technology, the core business forms of China's online copyright industry have broken through traditional boundaries and integrated, resulting in a more diversified industrial structure. Network information resources have entered the era of full-copyright operation, where different forms of copyrighted works complement and promote each other to maximize copyright revenue. Meanwhile, user payment structures have become more diversified, with users' recognition of the value of copyrighted content such as online literature, knowledge, video, and music continuously increasing, along with their willingness to pay, which has greatly incentivized the emergence of high-quality content. China's copyright market has demonstrated tremendous potential.

However, through literature review and in-depth investigation of the current copyright trading status on some platforms, it has been found that China's

online copyright trading industry development is not stable. There are prominent problems such as singular copyright operation activities, rigid copyright trading service models, and uneven distribution of copyright revenue, mainly manifested as the contradiction between the value creation demand of information resources and the low quality and efficiency of copyright trading. Therefore, effectively integrating internal and external information resources, talent, and technology production factors to conduct collaborative innovation and optimize the existing copyright trading structure has become an inevitable choice for online copyright trading development under the new situation. Currently, the innovation paradigm is undergoing a new round of transformation and upgrading, with independent innovation systems gradually shifting to collaborative innovation ecosystems. An innovation ecosystem, as a collaborative innovation network based on an open environment, can explain the complexity of the copyright trading environment and the growth and development of participating subjects, providing new ideas and directions for the development of China's network information resource copyright trading.

Analyzing online copyright trading in a dynamic environment and promoting the transformation of innovation elements for online copyright trading can improve the quality and efficiency of copyright trading, thereby achieving healthy development of copyright transactions and promoting the prosperity of the copyright industry and culture.

1 Literature Review

Copyright trading is an important link in capturing and creating value from network information resources. Therefore, the importance of improving the quality and efficiency of online copyright trading is self-evident. Current scholars have conducted research from legal, mechanism, economic, and technological dimensions. For example: Li Guangxia proposed specific plans to improve the digital copyright transfer system, digital copyright licensing system, and basic legal system for digital publishing. Liu Lingwu optimized the copyright trading mechanism based on a multi-task principal-agent model framework in the context of media convergence. Huang Xuan et al. designed an intelligent evaluation system for digital copyright value based on fuzzy logic to assist digital copyright trading business development. Ran Congjing et al. and Qin Ke constructed new copyright trading models under cloud environments and blockchain technology from a technical perspective.

It can be seen that although existing research has made certain progress, the research perspectives are single and do not consider the cross-coupling effects of multiple factors influencing online copyright trading. In 2003, the U.S. President's Council of Advisors on Science and Technology first proposed the concept of "innovation ecosystem" in its advisory report, and research on "innovation ecosystem" has gradually penetrated into economics, education, science and technology management, and other fields, being widely applied. However, literature review shows that this concept has not yet been applied to copyright

trading research. Only a few scholars have conducted research from the perspective of "copyright trading ecology," mainly focusing on two dimensions:

(1) **Copyright Trading Ecological Models.** Lou Cequn et al. proposed four resource sharing modes—integrated, commissioned, rental, and exchange—and their application scenarios based on the network information ecological chain framework. Wang Taixing used the ecological niche concept of survival, development, and competitive evolution relationships among biological units to interpret the three types of ecological interaction dilemmas—technology, traffic, and copyright—currently existing in knowledge payment and digital publishing. Yan Shaoning constructed an internal and external linkage cycle of video website payment ecology from micro and macro perspectives. However, these studies did not inject "innovation system" into "copyright trading ecology," lacked system-level elaboration, and only one-sidedly emphasized the impact of one or several elements on copyright trading.

(2) **Dynamic Evolution Research on Copyright Trading Ecology** is even rarer. Yin Ketao used knowledge diffusion theory to study resource flows within and between nodes in the digital publishing ecological chain and further analyzed the dynamic mechanism of circulation and its value-added process. Lou Cequn et al., considering copyright system factors, proposed that the evolution of the network information ecological chain needs to go through four stages: the gestation and generation of evolutionary dynamics, the advanced evolution of key factors, the collaborative development of related factors, and the final realization of advanced balance. However, existing research does not deeply reveal how various elements interact to promote evolution and does not propose countermeasures to support the sustainable development of online copyright trading.

In summary, this paper attempts to introduce the concept of "innovation ecosystem" into the research field of network information resource copyright trading, relying on dissipative structure theory to explore the construction of a network information resource copyright trading innovation ecosystem model and evolution path model, discuss innovation dimensions, innovation effects, and development countermeasures, with a view to providing a new approach for enriching online copyright trading research results, improving the quality and efficiency of online copyright trading, revealing the growth patterns of online copyright trading, and guiding the sustainable development of the online copyright industry.

2 Network Information Resource Copyright Trading Innovation Ecosystem

2.1 Applicability of Dissipative Structure Theory

Dissipative structure theory is a self-organization theory about non-equilibrium systems. The theory holds that systems that produce dissipative structures should possess the following characteristics: First, the system must be open and maintain a non-equilibrium state; second, the system has fluctuation effects; third, the system has non-linear interactions internally. Since the network information resource copyright trading innovation ecosystem satisfies the above "dissipative structure" characteristics, it constitutes a dissipative structure system. The specific reasons are as follows:

First, the online copyright trading innovation ecosystem is open and far from equilibrium. The online copyright trading process maintains openness to the external environment through system boundaries, conducting dynamic exchange of material flow, energy flow, and information flow, which causes mutual changes and adaptive adjustments among innovation elements, breaking the system's near-equilibrium state and maintaining a non-equilibrium state. This continuously preserves innovation momentum and vitality, making the system state possess the possibility of continuous development and change.

Second, the online copyright trading innovation ecosystem has fluctuation effects. The external environment changes in real time, triggering energy fluctuations in the online copyright trading process and prompting corresponding changes in the system. These changes have the possibility of evolving toward the direction of system balance. Moreover, when a certain parameter within the system fluctuates to a critical value, the system will exhibit new ordered copyright trading processes in terms of time, space, and function under the influence of the external environment.

Finally, the online copyright trading innovation ecosystem has a non-linear mechanism. The innovation ecosystem has independent yet functionally complementary biological and non-biological elements. Through collision and fusion among these diversified elements, new structures and new elements spontaneously form, reaching a new trading steady state.

2.2 Construction of the Dissipative Structure Model

Possessing a dissipative structure is the foundation and necessary condition for the evolution of an innovation ecosystem. Drawing on existing research on copyright trading ecology and development practice, this paper constructs a dissipative structure model of the network information resource copyright trading innovation ecosystem, as shown in Figure 1 [Figure 1: see original paper].

As shown in Figure 1, the dissipative structure of this system mainly consists of three parts: the element dimension, transmission dimension, and target dimension. The element dimension is the premise for each innovation subject

to flexibly select connection mechanisms in the transmission dimension. The transmission dimension is the guarantee for the element dimension to form a connection network and for the target dimension to carry out system function design. The target dimension is the representation of the cross-fusion between the transmission dimension and the innovation environment to achieve system functions. Different dimensions complement each other, meeting the value creation needs of innovation subjects and maximizing benefits.

2.2.1 Element Dimension The element dimension mainly consists of biological elements (innovation populations) and non-biological elements (innovation environment). Biological elements are mainly collections of innovation subjects that have innovation capabilities and independent decision-making power in innovation activities, can bear the responsibilities and risks of innovation activities, and obtain innovation benefits from them. According to the functional division in the copyright trading innovation process, these innovation subjects are divided into four different innovation populations: original innovation population, collaborative innovation population, service innovation population, and legal innovation population. The composition and main functions of innovation subjects in different innovation populations are shown in Table 1 . Non-biological elements include policy guidance, legal norms, technical support, cultural cultivation, as well as market and network environments.

2.2.2 Transmission Dimension The transmission dimension characterizes the connection mechanisms between homogeneous or heterogeneous innovation subjects during system operation, mainly realized through the transmission relationships of energy, material, and information between innovation subjects and the innovation environment. These connections may be for cooperation due to shortage of information resources, competition due to similar information audiences, parasitism due to backward technology, symbiosis based on trust and mutual benefit, or active adaptation by backward subjects seeking change and innovation.

Among them, the interaction between information resource creators, network content service providers, and users (purchasers) is the core link of value creation in this innovation ecosystem, as shown in Figure 2 [Figure 2: see original paper]. Information resource creators, as innovation producers, mainly transfer information resource works to the dissemination platforms provided by network content service providers through contracts such as resource sharing, copyright licensing, and copyright transfer. Network content service providers, as innovation consumers, take absorbing information resources from innovation producers as the premise for their own survival and development. They screen, integrate, evaluate, and classify recommend the received information resources to improve copyright trading efficiency, and obtain more copyright revenue through copyright operation models such as statutory licensing, fair use, copyright licensing, copyright transfer, and copyright capitalization operation. Network users, as innovation decomposers, feed back resource evaluations and information needs to

information resource creators and network content service providers through private messages, comments, bullet chats, and rewards. The latter two receive feedback to produce higher-quality information resource content, thereby forming an information resource innovation cycle that ensures copyright trading quality. In the user-generated content (UGC) era, the boundary between creators and users is increasingly blurred, and users can easily complete the transformation from innovation decomposers to innovation producers.

Meanwhile, non-biological elements such as capital flow from financial institution investments, policy flow formulated by government departments, and information flow generated by cultural cultivation also flow into the innovation ecosystem, stimulating fluctuations within the system. Some fluctuation components quickly decay, prompting random system evolution, while others gradually accumulate. When accumulated to a certain critical state, they cause the copyright trading process to enter an innovation process and reform an ordered state of copyright trading.

2.2.3 Target Dimension The operation goals of this innovation ecosystem mainly cover four aspects: First, **demand satisfaction**. It should not only maximize the satisfaction of users' information needs, enrich users' information experience, and stimulate user re-consumption, but also satisfy the value creation and transformation needs of innovation subjects, provide more efficient trading services, and maximize benefits. Second, **balanced benefit distribution**. Where there are benefits, there are disputes. The innovation benefit distribution mechanism is always a work in progress. Grasping the fairness of rights and obligations of innovation subjects and balancing public and individual interests reflects the maximization of work utility. Third, **trading performance improvement**. The examination of online copyright trading performance has two aspects: trading efficiency and trading effectiveness. Trading efficiency focuses on whether innovation inputs such as platform construction, capital investment, and technology investment are effectively utilized and whether copyright trading is efficiently conducted. Trading effectiveness abstractly refers to innovation subjects' sense of gain from trading activities, trust in trading models, and recognition of trading quality, concretely manifested in the increase of online copyright industry output value. Fourth, **sustainable copyright trading development**. Multi-element innovation leads to balanced development of online copyright trading, while balanced copyright trading development also feeds back the cultural cultivation process and attracts capital investment and technology investment, forming a benign online copyright trading norm.

3 Evolution Path of the Network Information Resource Copyright Trading Innovation Ecosystem

To track the fluctuation direction and space of the network information resource copyright trading innovation ecosystem, grasp the growth patterns of copyright trading, and guide the sustainable development of the online copyright industry,

it is necessary to further explore the system's dynamic evolution process.

3.1 Evolution Path

On the one hand, this study attempts to establish a connection between ecological theory and dissipative structure theory. On the other hand, it sorts out the evolution path of this innovation ecosystem, focusing on the evolution level and innovation efficiency at different life cycle stages, and then discusses innovation dynamics and innovation effects. The constructed evolution path model of the network information resource copyright trading innovation ecosystem is shown in Figure 3 [Figure 3: see original paper].

3.1.1 Path Interpretation Based on the above model, this paper attempts to provide a definition of the network information resource copyright trading innovation ecosystem: The network information resource copyright trading innovation ecosystem is a bottom-up emergence process from single innovation subjects to an innovation ecosystem with network connectivity characteristics, composed of biological elements such as original innovation population, collaborative innovation population, innovation service population, and legal innovation population, as well as non-biological elements such as network information resources, support factors for copyright trading, and the innovation environment. It aims at collaborative innovation and realizes the interaction between internal and external systems through the transmission of energy, material, and information, promoting the development and expansion of the copyright trading process.

As shown in Figure 3, initially, the copyright ecological environment has no obvious boundaries, and various types of innovation subjects such as resource creators, network service providers, users (purchasers), governments, and technology R&D enterprises operate independently. However, with the input of innovation element control flows such as law, culture, technology, and innovation investment in the innovation environment, innovation subjects with new functions continuously enter the innovation ecosystem. At the same time, fierce competition leads to survival of the fittest, and backward innovation subjects exit the online copyright trading market, causing quantitative changes in innovation subjects. Second, the quantitative changes of innovation subjects trigger qualitative changes, increasing or decreasing, generating or eliminating different types of connection relationships between subjects, and deriving increasing scale and connection complexity of subjects, gradually expanding into innovation populations with network structures. Different innovation populations aggregate due to the common innovation goal of improving copyright trading quality and efficiency, ultimately achieving innovation emergence of network information resources, copyright operation activities, and copyright trading service models.

Focusing on the evolution level and system innovation efficiency within the system evolution life cycle can grasp the growth patterns of copyright trading and facilitate innovation subjects to make copyright trading decisions. When the

dissipative structure plays its role and positive/negative entropy flows into the system, the frequency and rate of innovation element flow increase, enabling efficient interaction and frequent exchange between innovation populations and the innovation environment. The system evolution level increases, and innovation efficiency increases accordingly. When entropy increase reaches a critical value, copyright trading gradually becomes orderly, as shown in the T0-T2 segment in Figure 3. At this stage, a large number of innovation subjects enter the system, technical support and capital investment are sufficient, the demand for information resource value transformation surges, which matches users' information consumption needs and financial institutions' subscription needs. This is the best period for copyright trading, with high trading efficiency and huge profits.

However, when the energy and material flow inside and outside the system tends to slow down, it means that innovation efficiency has reached its peak and system evolution tends to mature. At this time, the copyright market finds it difficult to follow the diversified needs of users and investors, and its ability to meet information resource value transformation gradually becomes insufficient, causing massive online information resources to be ignored. Coupled with the potential risk of copyright infringement causing creators to refuse copyright trading, an "information bubble" phenomenon occurs, and copyright trading efficiency decreases. If the system is satisfied with the status quo and does not promptly conduct a new round of exchange of material, energy, and information with the external environment, innovation efficiency will continue to decline, and the evolution level will gradually decrease after reaching its peak. The system will enter a decline and degradation stage, as shown in the T2-T4 segment in Figure 3. At this time, the copyright market will be sluggish, with unprecedentedly low trading quality and efficiency, making it the most unsuitable time to carry out copyright trading. If the system actively opens up to receive fresh material, energy, and information, innovation subjects increase innovation input, and actively carry out cultural innovation, legal innovation, and technological innovation to break the internal rigid balance pattern, enabling innovation efficiency to enter the next cycle, then the system will be revitalized and move toward the next round of structural optimization, and the heyday of copyright trading will come again.

3.1.2 Innovation Effects The dual role of system innovation internal driving force and boosting force gives birth to network information resource innovation. Various resource production methods, copyright forms, and derivation methods emerge as the times require, becoming the source of continuous online copyright trading. However, they themselves are not copyright activities. The core achievements of online copyright trading innovation are copyright operation activity innovation and copyright trading service model innovation, thereby improving the value transformation efficiency of network information resources.

Copyright operation activity innovation refers to any copyright operation behavior that makes copyright revenue sources more diversified, creates as much

economic value as possible, and meets the benefit distribution needs of innovation subjects. According to the current actual development status, evolution dynamics not only promote the transformation of the scope and methods of traditional copyright licensing and copyright transfer but also make copyright capitalization operation models gradually favored by innovation subjects, becoming an important trend in copyright operation. Specifically, the essence of copyright capitalization operation is the combination of copyright property and capital operation models, treating copyright as capital to participate in financing activities, such as copyright securitization, pledge targets, and copyright investment. For example: Longjie Media, China's largest audio copyright supplier and operator, conducts financial operations on audio copyrights. The company adapts literary works signed with writers into audio books and prices the audio copyright based on operating income, then sells it as intangible assets to investors. In September 2019, it opened 100 benefit share subscriptions for the audio copyright of "Ye Ke's Criminal Police Notes: Criminal Motive," which were all sold out in just 3 hours.

Copyright trading service model innovation refers to the improvement or transformation of new methods related to information resource transfer, information demand satisfaction, and transaction payment in the copyright trading process. Network content service providers, as the core subjects of the service innovation population, provide channels for information resource and user interaction, have control and allocation rights over information resources, and should bear the responsibility for copyright trading service model innovation. Therefore, network content service providers are obligated to innovate information resource transfer channels, broaden channels for information resource benefit creation, and accelerate information resource trading efficiency; innovate information demand matching models to meet users' various experience needs such as social interaction, feedback, and technology, continuously enhancing user experience and stickiness; innovate information resource pricing strategies, formulate reasonable and balanced benefit distribution mechanisms, continuously collect profit returns including membership fees and copyright shares, and ensure the legitimate rights and interests of all innovation subjects; innovate copyright trading payment methods to meet different payment needs such as online banking and third-party payment, ensuring the security and convenience of payment services.

3.2 Evolution Stage Analysis

Based on the evolution analysis results, this section calculates the evolution stage of China's online copyright trading development to further provide references for proposing countermeasures to promote the sustainable development of the online copyright industry.

3.2.1 Data Sources The annual output value of the network core copyright industry can directly reflect the status quo of China's online copyright trading.

This paper uses China's network core copyright industry output value data from 2008-2019 as analysis samples, with data sourced from the "China Network Copyright Industry Development Report" released by the National Copyright Administration Network Copyright Industry Research Base, as shown in Table 2 .

3.2.2 Basic Theory of the Gompertz Model The Gompertz curve model fitting results can more intuitively correspond to life cycle evolution stages, hence it is selected.

Step 1: Its expression is:

$$\hat{y}_t = Ka^{b^t}$$

where K, a, and b are specific parameters, and the values of K, a, and b determine the evolution stage of China's network information resource copyright trading innovation ecosystem. Corresponding to Figure 3, the criteria are as follows: If $\lg a > 0$ and $b > 1$, it indicates that the copyright trading innovation ecosystem is in a slow formation period, where innovation subjects operate independently, innovation efficiency growth is slow, and output value growth is slow; If $\lg a < 0$ and $0 < b < 1$, it indicates that the copyright trading innovation ecosystem is in a rapid expansion period, where innovation subjects collaborate, fluctuations accumulate, and innovation efficiency is high; If $\lg a < 0$ and $b > 1$, it indicates that the copyright trading innovation ecosystem is in a development maturity period, where innovation efficiency tends to be saturated, shows a downward trend, and competition among innovation subjects intensifies; If $\lg a > 0$ and $0 < b < 1$, it indicates that the copyright trading innovation ecosystem is in a decline and degradation period, where innovation momentum is low and benefits decline.

Step 2: Solving equation (1), take logarithms on both sides of the expression:

$$\lg \hat{y}_t = \lg K + b^t \lg a$$

Step 3: Use the three-sum method to solve equation (2), dividing the sample data into 3 segments, each with n values. Let the three local sums of sample data be S_1, S_2, and S_3:

$$S_1 = \sum_{i=1}^{n} \lg y_i, \quad S_2 = \sum_{i=n+1}^{2n} \lg y_i, \quad S_3 = \sum_{i=2n+1}^{3n} \lg y_i$$

$$b = \sqrt[n]{\frac{S_3 - S_2}{S_2 - S_1}}$$

$$\lg a = \frac{S_2 - S_1}{(b^n - 1)^2}$$

$$\lg K = \frac{1}{n}\left[S_1 - \frac{b^n - 1}{b - 1}\lg a\right]$$

Step 4: Obtain the values of K, a, and b to get the Gompertz model expression.

3.2.3 Case Analysis According to equations (3)-(6), we can obtain:

$$b = 0.943100708; \quad \lg a = -2.943996793; \quad \lg K = 5.531691295$$

Further calculations yield:

$$a = 0.001137636, \quad K = 340166.3067$$

Thus, the Gompertz model for China's network information resource copyright trading innovation ecosystem is:

$$\hat{y}_t = 340166.3067 \times 0.001137636^{0.943100708^t}$$

Since $\lg a < 0$ and $0 < b < 1$, it is determined that China's network information resource copyright trading evolution stage is in a rapid expansion period. This shows that China's online copyright trading volume will further increase, and the development prospects of the network information resource copyright industry are promising. Additionally, equation (7) can be used to predict China's network copyright industry output value in the short term, as detailed in Table 3 .

Table 3 Prediction of China's Network Core Copyright Industry Output Value for 2020-2023

Year	Trend Value (billion yuan) / $\hat{y}_t$
2020	11860.6
2021	14356.2
2022	17189.3
2023	20371.5

4 Countermeasures for Promoting Sustainable Development of Online Copyright Trading

The case analysis results in Section 3.2 show that China's online copyright business forms have strong development momentum. However, the "innovation dividend" at this stage will gradually decline and degrade with the popularization of technology and the transformation of network economic models. To enable network information resources to continuously achieve value creation and transformation through copyright trading, it is necessary to stimulate internal

innovation vitality, maintain the cycle and exchange of innovative energy, material, and information with the external environment, and continuously enhance innovation potential. Therefore, through the construction and evolution analysis of the network information resource copyright trading innovation ecosystem, this paper proposes that innovation is the decisive force for promoting the sustainable development of online copyright trading. Specific countermeasures and suggestions are as follows:

4.1 Diversified Subjects to Consolidate Innovation Foundation

The quantity and diversity of innovation subjects are prerequisites for ensuring that the system facilitates connection mechanisms among subjects and carries out innovation activities. The richer the innovation populations in the ecosystem, the more likely innovation subjects are to obtain environmental responses and trial-and-error space, and the more conducive it is to the continuous conduct of copyright trading. For example, in recent years, the operation model of online video service providers has shifted from free services to paid services, but has been continuously losing money. Internet companies such as Alibaba, Tencent, and Baidu, as collaborative service innovation populations, have entered the copyright trading innovation ecosystem at the right time, investing and participating in platform operations, helping many video platforms escape the predicament of capital chain rupture.

4.2 Legal Innovation to Consolidate Innovation Achievements

Any innovation activity relies on the accumulation and continuous incentive of legal system innovation and consolidates innovation achievements. The current online copyright trading environment is complex, with frequent infringement acts and disputes over copyright revenue distribution. It is necessary to further revise relevant legal systems such as the Copyright Law and the Regulations on the Protection of Information Network Transmission Rights, focusing on establishing and improving the scope of fair use and statutory licensing in the network environment, “third-party liability for copyright infringement,” “copyright technical measures,” and rules for the utilization of network orphan works, to ensure the security and fairness of network information resource copyright trading.

4.3 Literacy Enhancement to Strengthen Innovation Belief

Frequent infringement incidents in the online copyright trading process reduce the quality and efficiency of copyright trading, causing serious losses to information resource creators and network content service providers. Innovation subjects generally believe that the responsibility for ensuring fairness in online copyright trading should rest with network content service providers, ignoring the importance of their own participation. In fact, all innovation subjects should build a network copyright moral system, enhance intellectual property literacy, regulate information resource usage behavior through inner self-discipline,

strengthen the belief that online copyright trading innovation is their responsibility, and cultivate a good cultural innovation environment for the sustainable development of online copyright trading.

4.4 Technological Change to Advance Innovation Process

Technology not only determines the manifestation of information resources but also restricts the dissemination and trading processes of information resources. Therefore, technological innovation is the key force for upgrading the online copyright trading structure. Currently, technologies involved in online copyright trading are generally divided into three types: protecting work integrity, payment tracking, and online payment. Usually, network content service platforms or creators use technologies such as digital signatures and electronic watermarks to protect work integrity, then use cloud computing or blockchain technologies to track user resource usage, thereby collecting membership fees or corresponding remuneration through online trading platforms. Of course, copyright trading technological innovation is not limited to this; it is an emergence process that changes with scientific progress and copyright market changes. However, technological innovation should also pay attention to the degree of copyright protection and should not over-protect, thereby infringing on users' rights to access, browse, cite, and copy network information resources and hindering the copyright trading process.

4.5 Innovation Input to Stimulate Innovation Vitality

The innovation ecosystem mainly establishes a diversified innovation input system through the aggregation and allocation of talent, capital, and scientific and technological achievements, improves the innovation input-output ratio, and promotes the stable operation of the overall system function. Among them, innovation capital sources are mainly platform revenue as the main body, government special funds as guidance, financial institution investment as assistance, and copyright association fundraising as supplement. At the same time, it attracts outstanding innovation talents to join the system, dynamically adjusts and structurally optimizes the copyright trading process, and carries out scientific and technological innovation to ensure the improvement of copyright benefits. Multiple innovation input elements complement each other and become the lifeblood of the sustainable development of online copyright trading, helping trading vitality to never dry up.

Conclusion

Innovation theory leads innovation practice. Based on ecological theory and dissipative structure theory, this paper conducts a comprehensive study on the element composition, connection mechanisms, and functional effects of the network information resource copyright trading innovation ecosystem. On this basis, using a combination of qualitative and quantitative methods, it specifi-

cally studies the evolution process, innovation effects, development status, and countermeasures for promoting the sustainable development of online copyright trading of this innovation ecosystem. The main conclusions are as follows:

(1) In the network information resource copyright trading innovation ecosystem, the original innovation population, collaborative innovation population, service innovation population, and legal innovation population have different innovation functions. Only by relying on connection relationships such as symbiosis, co-opetition, parasitism, and active adaptation to carry out collaborative innovation can the value creation needs of information resources be met, copyright trading output value be increased, balanced benefit distribution be promoted, and sustainable development of online copyright trading be achieved.

(2) The quantitative and qualitative changes of innovation subjects, as well as the real-time flow and transmission of innovation elements such as law, culture, technology, and innovation input, drive system evolution and ultimately achieve innovation emergence of network information resources, copyright operation activities, and copyright trading service models. During the system's slow formation period and rapid expansion period, it is the golden period for copyright trading, with unprecedentedly high trading quality and efficiency and maximum benefits. During the system's development maturity period and decline degradation period, the "information bubble" cannot meet the evolving information needs, and the low copyright trading efficiency cannot meet the resource value creation needs, making it the most unsuitable time to carry out copyright trading.

(3) The case analysis shows that China's online copyright industry is in a rapid expansion period, with a bright prospect for the online copyright market. However, to ensure that online copyright trading can achieve high-quality and sustainable development, it is proposed to diversify participating subjects to achieve symbiotic win-win in online copyright trading; improve legal policies to consolidate the cornerstone of long-term development of online copyright trading; enhance copyright literacy to strengthen the belief in fairness of online copyright trading; apply advanced technologies to improve the efficiency of online copyright value conversion; and increase innovation input to stimulate the vitality of online copyright trading innovation. It is hoped that this can provide reference for China's online copyright trading to move toward standardization and a more mature development path.

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Author Contributions

Li Shan: Mainly responsible for paper framework formulation, initial draft writing and revision.
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Research on the Construction and Evolution Path of the Innovation Ecosystem for Network Information Resource Copyright Transactions

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Abstract: [Purpose/significance] Promoting online copyright trading under the new situation can accelerate the value creation and transformation of information resources. Constructing an innovation ecosystem for network information resource copyright transactions and exploring its evolution path is conducive to revealing the growth patterns of online copyright trading and guiding the sustainable development of the online copyright industry. [Method/process] Based on dissipative structure theory and according to the core elements and processes of network information resource copyright transactions, this study constructs an innovation ecosystem for online copyright trading, explores the evolution path of system innovation, and calculates the evolutionary stage of China's online copyright industry development. [Result/conclusion] In the innovation ecosystem, the quantitative and qualitative changes of innovation subjects, together with the real-time information transmission, material circulation, and energy flow among innovation elements such as law, culture, technology, and innovation input, drive system evolution and achieve three major innovation effects: innovation of network information resources, innovation of copyright operation activities, and innovation of copyright trading services. China's online copyright industry is in a period of rapid expansion. It is recommended to diversify participating subjects, improve legal policies, enhance copyright literacy, apply advanced technologies, and increase innovation input to support the steady development of online copyright trading.

Keywords: network information resources; copyright transaction; innovation ecosystem; dissipative structure; copyright operation

Note: Figure translations are in progress. See original paper for figures.