Research and Analysis on the Information Management of Intellectual Property in Military Academies Based on Blockchain Technology

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Abstract-The creation of intellectual property in military academies is mostly based on scientific research projects, but the management of intellectual property in academies still stays in the administrative management stage such as classification and summary, result statistics, and process management, neglecting the management links of intellectual property incubation, confirmation of rights, property rights traceability and proof of rights maintenance in the project research process, and failing to integrate intellectual property acquisition, application, protection, inspection and improvement into the whole process of scientific research projects. This paper analyzes the problems of intellectual property management in the process of scientific research projects in military academies, combines the application prospect and development trend of blockchain technology in the field of intellectual property management, and explores the research of full-cycle intellectual property information management of scientific research projects based on blockchain technology to further promote the scientific and technological innovation, independent innovation capability, and scientific research project management in military academies.

Keywords- Military academies; Full-cycle information management of intellectual property; Blockchain technology

1 INTRODUCTION

The creation, implementation, and maintenance of intellectual property are inseparable from effective management of intellectual property. Intellectual property management in higher education institutions is a systematic project integrating strategy formulation, system design, process monitoring, and application implementation, which runs through the process of creation, protection, and application of intellectual property, mainly including the organization

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management, resource management, development management, operation and use management, revenue management, and disposal management, etc. As an important part of the national defense science and technology innovation system, military academies undertake most of the scientific research tasks involving national defense science and technology and weapons and equipment. They are responsible for military scientific and technological innovation and the training of high-quality talents. However, the database that brings together the results of scientific research tasks has problems such as lack of transparency, susceptibility to malicious attacks, and weak reconfiguration ability in case of random failures. The result information is easily stolen by people with ulterior motives, coupled with the fact that the current concentrated and centralized storage model makes it impossible to even inquire into the source of works once key information is lost and tampered with, which shows that there are serious loopholes in the traditional intellectual property management. Therefore, it is urgent to reform and innovate the management mode of intellectual property in military academies to enhance the capability and level of scientific and technological innovation in military academies, protect the interests of scientific researchers, the military, and national intellectual property, and prevent the loss of intellectual property achievements.[1]

As a carrier of intellectual property, the intellectual achievements of scientific research projects can be parsed as information with exclusive significance, while blockchain technology, as a revolutionary technology in the information age, has excellent decentralization, de-trusting, traceability, and anti-tampering characteristics for information acquisition, storage, circulation, and protection, which provides a new way of thinking to solve the problems of a long time for the confirmation of rights, weak traceability of property rights, and difficulty in proof of rights maintenance in intellectual property management. The decentralized and distributed nature of blockchain predicts that intellectual property creators may complete the registration on the chain at any time and place in the future, simplifying the registration process and shortening the time for confirmation of rights; its traceability and de-trusting nature indicates that it can record the unique and tagged property rights information circulation channels and nodes in real time, enhancing protection and reducing the occurrence of infringement; its open and autonomous nature forebodes that it can realize the existence of property rights and solve the dilemma of depositing evidence, etc. [2]

2 PROBLEMS IN THE MANAGEMENT OF INTELLECTUAL PROPERTY IN MILITARY ACADEMIES

Nowadays, society has entered into the information technology era, and the management of intellectual property creation, protection, and circulation is facing unprecedented challenges, while military academies still adopt the traditional model of concentrated, centralized, and paper-based intellectual property management, which is deeply in dilemmas lacking high credibility, transparency, foresight, and systematicness, and there are three problems such as weak awareness of intellectual property, loopholes in operation and supervision, and imperfect management system.

2.1 Weak awareness of intellectual property

The intellectual property of military academies basically relies on scientific research projects. The following is a comparison of the ratio of the number of patents granted to the total number of scientific research projects undertaken by several domestic key local universities and military academies relying on scientific research projects during the period from the 11th Five-Year Plan to the 13th Five-Year Plan, as shown in Figure 1. The analysis shows that the scientific researchers of military academies have increased their awareness of intellectual property protection and transformation in recent years, but they still lag behind the domestic first-class local universities and are at a low level. The data sources from the patent search and analysis system of the State Intellectual Property Office, SooPAT patent search tool, and relevant university annual reports. The search time is November 2021.

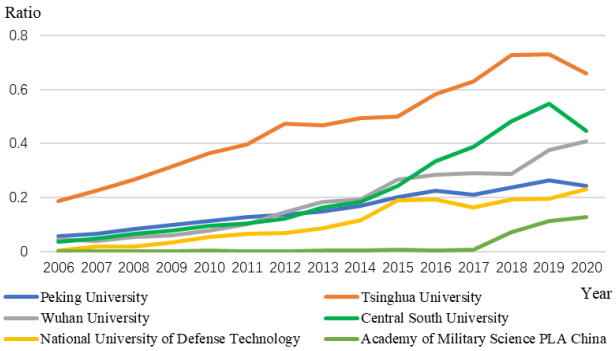

Figure 1. Comparison of patent application rates between domestic key local universities and military academies

At present, scientific research personnel in military academies have a weak awareness of intellectual property creation and protection. On the one hand, they lack basic knowledge of intellectual property and do not know much about the contents, types, and application process of intellectual property; on the other hand, the talent value evaluation system of military academies, such as the promotion of titles and merit awards, focuses more on the declaration of high-level scientific research projects and the publication of high-level academic papers, and less on the application of intellectual property and the transformation of achievements in terms of the innovative achievements of scientific research personnel. Furthermore, the complicated property rights excavation, tortuous patent application, long transformation of achievements and vague property rights ownership, further cause scientific researchers to avoid and resist intellectual property, and put more energy on the publication of papers and the award of achievements, directly causing the loss of intellectual property; even though some achievements have applied for intellectual property, due to the lack of in-depth understanding of intellectual property, they only take authorization as the final result of obtaining intellectual property, and neglect the subsequent management and maintenance of property rights, which also leads to the loss of intellectual property, and also makes the transformation and application of intellectual property achievements at a later stage unrealizable; there is no lack of some achievements that have applied for patents, but the phenomenon of focusing on quantity but not quality is repeatedly corrected, resulting in more honorable patents and junk patents, which also caused the unconscious loss of intellectual property.

2.2 Difficulties in intellectual property supervision

Lack of professional supervisors. The development, creation, protection, and operation of intellectual property in military academies involve scientific and technological research activities in the full cycle of scientific research projects, the tasks of which are onerous and arduous. However, most of the current intellectual property management personnel are concurrently assumed by scientific researchers in the project team and scientific research management agencies, lacking a systematic, specialized, and overall intellectual property thinking of nature, so that the management work has remained at the passive transactional management level for a long time, and it is impossible to actively conduct intellectual property mining, certification, and protection. Intellectual property management relies heavily on intellectual property talents. In recent years, despite the increased awareness of intellectual property protection in military academies, the importance attached to intellectual property talents is still at a low level, and they do not realize the decisive role of professional talents to the whole project team, even the construction of the intellectual property operation system of the whole academy.

Backward supervision method. With the application of information technology, the rapid development of the knowledge economy, and the acceleration of data sharing, the creation, protection, and operation of intellectual property of military academies still stuck in the use of traditional ledgers and forms , etc., to record technical inventions and achieve the supervision of intellectual property activities, i.e., managers are subject to the constraints of time and space and must store and record intellectual property information and sign in a specific logbook or independent data center repository before the deposition can be completed. With this paper-based and centralized storage model, it is highly likely that registration information will be accidentally or deliberately leaked, which may lead to infringement and other illegal incidents. Once the database is tampered with, stolen, or accidentally destroyed, it will be extremely difficult for the right holder to prove, trace, and reconstruct the database, which will inevitably lead to the loss of intellectual property [3].

2.3 Incomplete intellectual property management system

At present, the management of scientific research projects in military academies has formed a comprehensive and systematic management system. The nodes from project declaration, project establishment, mid-term inspection to final acceptance and award submission are interlocked, and the mechanisms of outsourcing implementation, fund allocation, and personnel employment are running efficiently, but the management of intellectual property in military academies is still parallel to scientific research projects, not independently formed into a system, and there is a serious disconnection with scientific research management.[4] During the declaration, initial establishment stage, and implementation stage of scientific research projects, a well-defined implementation plan of project research is formulated, while intellectual property management is basically in a vacuum at this stage, and researchers who lack intellectual property expertise and awareness are dedicated to promoting project implementation. There is no time for them to take into account the records and evidence of intellectual property, which makes it difficult to obtain evidence and slow to authorize intellectual property at the later stage of the project, and even some projects divulged key research and development information at the beginning of the project or during the R&D

process, and as a result, the achievements are imitated and stolen by others. At the stage of completion and acceptance of project, the lack of a clear intellectual property plan at the beginning of the project, the failure to include the acquisition of intellectual property authorization in the list of project results, and the lack of attention to intellectual property mining and application prospect combing in the R&D process, result in few proposals for property rights and difficulty in writing and shortage of innovation in the later project results; at the stage of transformation and application of results, most of the research results of military academies are related to the national defense security field, and there is a lack of effective defense intellectual property acquisition and protection policies and rights and interests traceability methods. As a result, some of the achievements are not entered into the civil science and technology innovation and industrial development after being put into the field of weapons and equipment research and production, leading to a low conversion rate of intellectual property.

Therefore, only by establishing an effective, systematic, and comprehensive intellectual property management system, raising intellectual property awareness, improving intellectual property supervision methods, and tamping down supervision, can we sustain and steadily develop high-value, high-output, and high-quality intellectual property, truly protect innovation, and make intellectual property the core competitiveness of scientific research.

3 FULL-CYCLE INFORMATION MANAGEMENT OF INTELLECTUAL PROPERTY FOR SCIENTIFIC RESEARCH PROJECTS BASED ON BLOCKCHAIN TECHNOLOGY

In recent years, blockchain technology has matured and gradually applied to the field of intellectual property. Based on the excellent decentralization, consensus mechanism, and tamper-proof features of blockchain technology, a full-cycle management network containing such objects as researchers, institution management bodies, property rights offices, and notaries is formed to jointly verify and store data, which can effectively improve the security and transparency of intellectual property management system, increase the efficiency of deposition, and make up for the shortcomings of traditional copyright management methods which are bound by time and space. [5] Via constructing a full-cycle information management network of intellectual property for research projects based on blockchain technology, the networked and shared management of intellectual property is realized to ensure that managers complete key procedures such as intellectual property deposition, registration, confirmation of rights, circulation, and infringement traceability in the project R&D process intelligently, automatically and logically, so as to guarantee that project research and intellectual property management are carried out simultaneously. The whole-cycle information management of intellectual property of scientific research projects includes three parts: information network management of intellectual property system, information management of property rights chain, and information management of smart contract during the project development cycle. It is divided into three stages: project initiation, implementation, completion, and achievement transformation.

3.1 Information network management of intellectual property system at the initiation stage of scientific research projects

During the project initiation stage, according to the projects secret level, the project researchers, and the institutions intellectual property managers (or qualified intellectual property service agencies) are organized to carry out the intellectual property risk assessment, determine the research technology line, conduct patent information, literature intelligence, and other intellectual property mining work, and form information on early works of intellectual property. Using the information network management mode of intellectual property system, a blockchain network is built that connects researchers, university management agencies, property rights bureaus, and notary offices so that researchers can complete the early recording of property rights information and the early uploading of intellectual property information to the chain through the network, and log in to the works database of property rights bureaus for intellectual property retrieval, analysis, and data similarity detection, etc.; relevant works information is delivered to the personnel of university management agencies and notary office examiners in real time. It helps managers and examiners to quickly complete the early record of intellectual property, shorten the time of intellectual property confirmation at a later stage, and form work detection and analysis reports based on the review situation and feed it back to researchers.

The information network management model of blockchain-based intellectual property system realizes the networked, intelligent, and non-contact management of intellectual property records, retrieval, registration, change and transfer, as well as management of analysis, detection, and archiving by management agencies via building the intellectual property management process vein. Intellectual property record management can realize distributed deposition of information such as early intellectual property works and node files, and build a block database. Property search management can rely on the block database to break the restrictions of time and space to realize the query and traceability of users to whom the work belongs and the creation time, and introduce the national intellectual property database to complete the similarity and originality search. Intellectual property registration management can implement registration procedures such as uploading work data, filling in original information, and downloading property rights certificates. The analysis, detection, and archiving management conducted by management agencies through the blockchain network can realize real-time intellectual property retrieval, analysis, and detection, presenting the status of cutting-edge technologies and achievements in the project research field, which greatly facilitates researchers and managers to predict development trends, avoids infringement risks, revise R&D routes, improves R&D efficiency, and optimizes intellectual property layout, etc.

3.2 Information management of property rights chain at the implementation stage of scientific research projects

In the implementation stage, scientific researchers and management personnel fully interpret the intellectual property inspection and analysis reports formed during the project approval stage, track the dynamics of the research field, optimize the research project development plan for the technical problems to be solved in the research and development process, and rationally modify the technical direction and intellectual property layout route, evaluate, excavate and condense to form phased research results. The property chain management model of the full-cycle management network is used to construct the property chain context of the blockchain

network, which can realize the management of the calibration, circulation, and protection of phased works, and store the relevant information of the works on the chain to prevent the original work data from malicious modification, thereby realizing the overall management of the original staged works on the chain in the intellectual property system network.

The blockchain-based information network can be vividly described as being composed of a chain of property rights. Calibration management can put unique electronic labels on phased results and put them into the property chain to realize distributed storage. Circulation management can realize the circulation of achievement information in the blockchain network for management personnel or others to consult, learn, store, retrieve and obtain evidence, and generate unalterable block data for real-time recording and storage of evidence. Protection management prohibits others from changing the information of the results that have been registered and uploaded at will, realizes automatic encryption and locking when storing successful information, prevents secondary reproduction and theft, and effectively protects the originality of works; when the same or similar works appear, it is able to trace the initial creation time and information of the initial creator of the results, etc., and can provide proof of uniqueness.

3.3 Smart contract information management at the final acceptance and transformation stage of scientific research projects

The final acceptance stage is the most complicated and tedious stage in the whole process of intellectual property management of scientific research projects. The main task of this stage is to re-analyze the project research details and research results. Before the project is accepted, it is needed to analyze and form the final property rights results, disclose, and search non-sensitive information, retrieve, verify, and package intellectual property works, on-chain deposition and proof of existence information, and submit it to the property rights office for intellectual property application through the blockchain network. Via smart contract information management mode of the full-cycle management network, researchers can complete the data block contract signing with the property rights office on the blockchain network, complete the intellectual property deposition and generate the digital proof, realize the storage of all elements of information such as the original creator of intellectual property works, the time of first creation and the time of contracting, conduct intellectual property mining, analysis, feedback, and modification, and realize the deposition and proof of potential property rights results based on the contract. In the stage of achievement transformation, it is available to summarize the intellectual property creation and application of scientific research projects, sort out the list of intellectual property achievements of the project, form an independent and complete intellectual property analysis report, and propose a rationalization plan for intellectual property transfer and transformation. If there is a possibility of infringement, the block data package in the smart contract will be retrieved, and the block information in the data layer and the property rights information on the chain will be extracted through the retrieval and analysis tools to assist the right holder to defend his rights and achieve effective protection of intellectual property.

Blockchain-based smart contract information management can display certified intellectual property works online and push results against potential merchants, etc., and improve the efficiency of results transformation under the premise of protecting intellectual property with

high reliability; it can realize networked contracting of intellectual property works, distributed storage and decentralized deposition of files in multiple nodes such as user terminal, management terminal, and property rights bureau, etc., which improves the anti-destruction and property rights traceability of the database, effectively prevents malicious tampering, and realizes effective protection of intellectual property.

4 CONCLUSION

Military academies have special military attributes, and the research projects they undertake mostly involve sensitive fields, and the research is cyclical and long-term. The research results and intellectual property they created must serve the field of weapons and equipment research and production, which adds more demanding requirements to the management work, such as the registration, confirmation, transaction, maintenance, monitoring, and privacy protection of intellectual property. [6, 7] Blockchain technology-based full-cycle management of the intellectual property of research projects provides an opportunity to efficiently complete the management of property rights registration, confirmation, circulation, and protection for research projects with long periodicity and high confidentiality, from project creation and implementation to final acceptance and transformation of results, exploring the means of intellectual property deposition and information monitoring for the whole research cycle. In general, the future management mode of scientific research project + blockchain + intellectual property of military academies can cover various types of property rights such as non-written works, patents, and digital works of military academies, and realize a series of functions such as traceability and authentication of property rights information, property rights registration and property rights maintenance.

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