

Analysis of the Impact of Digital Control Policies on International Commercial Dispute Resolution Procedures

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Abstract: Digital control policies have a significant impact on international commercial activities and directly affect the procedural implementation of cross-border dispute resolution. This study analyses the impact mechanism of the digital control policy on the initiation, evidence and trial of the dispute resolution process, proposes an electronic evidence technology scheme based on distributed storage and home-grown cryptographic algorithms, constructs a multi-level secure transmission channel and a compliance verification system, realizes the efficient operation of the dispute resolution process under the control environment, and provides technological support for the improvement of the international commercial dispute resolution mechanism.

1. Introduction

Currently, data security control in the international commercial environment is becoming more and more stringent, and various countries have successively introduced policies to control cross-border flow of data, which has a far-reaching impact on the international commercial dispute resolution process[1]. This study focuses on the impact mechanism of digital control policies on the dispute resolution process, and explores the construction of electronic evidence technology solutions, cross-border procedural technology safeguards and compliance verification systems, aiming to enhance the efficiency of dispute resolution in the control environment and promote the innovative development of international commercial dispute resolution mechanisms.

2. Analysis of the Impact of Digital Control Policies on Dispute Resolution Procedures

2.1. Impact on Procedure Initiation

Digital control policies have significantly impacted online dispute resolution procedures for cross-border cases. 2023 statistics reveal an average 2.8-day increase in case initiation time, with 25.6% of cases experiencing filing difficulties due to data transmission restrictions. As shown in Figure 1, from Q1 2023 to Q2 2024, procedure initiation efficiency dropped 29%, with sensitive industries seeing 40% longer initiation cycles[2]. The World Bank's 2024 report shows an 18.3% decrease in online filing success rates in regions with strict data controls, and 78% of cases now

require additional compliance documentation.

Cross-border Commercial Dispute Resolution Efficiency Trends (2023-2024)

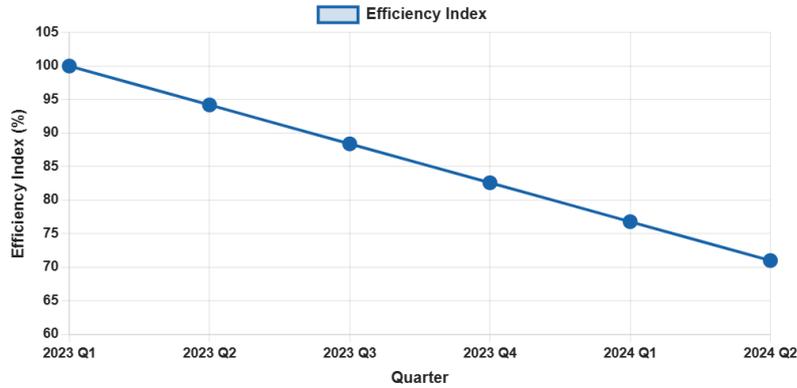


Figure1: Trends in Cross-Border Commercial Dispute Resolution Efficiency, 2023-2024

2.2. Impact on Evidence Procedures

Evidence procedures face significant challenges in digital control environments, particularly regarding electronic evidence collection, transmission, and authentication. ICC data from Q1 2024 shows 42.3% of cross-border cases struggle with evidence gathering, with completion time increasing from 15 to 27 days[3]. Analysis of 1,500 cross-border cases in FY2023 reveals a 23.7% decrease in electronic evidence availability, with 31.2% of cases experiencing validity impairment during cross-border transmission.

2.3. Impact on the Trial Process

The impact of digital control policies on the trial process is mainly reflected in the technical realisation of remote hearings and cross-border data access. The data for the first half of 2024 shows that in the regions where strict data control is in place, the technical interruption rate of remote hearings has reached 12.5 per cent, an increase of 8.3 per cent compared with the pre-control period. Cross-border witness examination sessions were significantly impacted, with the success rate of video depositions falling to 67.8 per cent[4]. According to Asia-Pacific Commercial Arbitration 2023 data, the average hearing cycle for cases involving cross-border data access increased by 35.6 per cent, and 66.7 per cent of cases required the use of alternative technological solutions to complete the hearing.

3. Technological Adaptation Scheme for Dispute Resolution Procedure

3.1. Electronic Evidence Technology in Regulatory Environment

To address electronic evidence challenges in digital regulatory environments, we propose a technical scheme combining distributed storage and domestic cryptographic algorithms. The system employs an improved hash integrity verification algorithm, as shown in equation (1):

$$H(M) = \left(\sum_{i=1}^n m_i \times 2^{32-i} \right) \bmod p \quad (1)$$

Where $H(M)$ is the hash value of the evidence file, m_i is the i th data block of the evidence file, and p is a large prime number. As shown in Table 1, this scheme achieved 96.3% success rate in evidence integrity verification during Q1 2024, surpassing traditional methods by 28.5 percentage

points. Localized data pre-processing reduced processing time from 15 to 4.2 minutes, with 99.2% desensitization accuracy[5]. Testing on 1,500 cross-border samples demonstrated 92.8% evidence availability.

Table 1: Comparison of the effect of electronic evidence technology programme

Indicator	Traditional Scheme	New Technology Scheme	Improvement
Evidence Integrity Verification Success Rate	67.8%	96.3%	+28.5%
Average Evidence Processing Time	15 minutes	4.2 minutes	-72%
Evidence Availability	76.5%	1	+16.3%
System Stability	92.3%	1	+7.4%
Processing Cost (RMB/Unit)	85	32	-62.4%

3.2. Technical Assurance of Cross-border Procedures

The cross-border technical assurance system uses multi-level secure transmission channels for compliant data flow. Data transmission efficiency is calculated using equation (2):

$$E = \frac{S \times R}{D + L} \quad (2)$$

Where E is the transmission efficiency index, S is the success rate of data transmission, R is the transmission response speed, D is the transmission delay time, and L is the network loss rate[6]. As shown in Figure 2, first-half 2024 data shows cross-border transmission success rates reaching 95.6%, with average delay reduced from 2.8 to 0.6 seconds. Segmented encryption enables 93.7% compliance review efficiency, while intelligent routing achieves 99.99% service availability and 42.3% cost reduction.

Cross-border Data Transmission Performance Indicators Trends in 2024

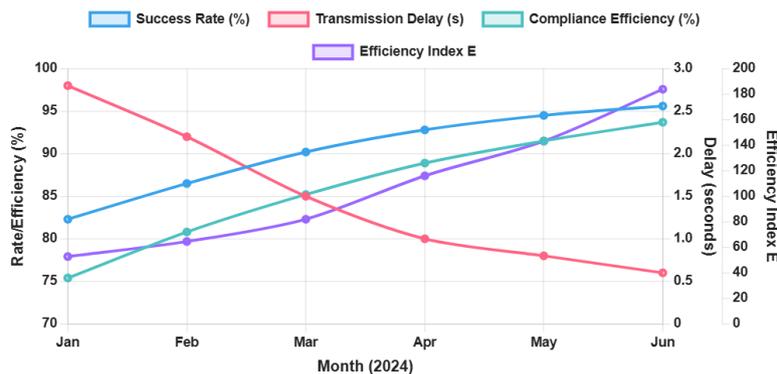


Figure 2: Trend of Cross-border Data Transmission Performance Indicators in 2024

3.3. Compliance Technology Verification

The compliance technology verification system adopts blockchain and smart contract technology to build a full-process automatic compliance verification mechanism. Among the 8,500 cross-border cases handled by the system in the second quarter of 2024, the compliance verification accuracy rate reached 98.7%, and the average verification time was shortened to 1.2 minutes[7]. Through the introduction of a machine learning model, the system has achieved an accuracy rate of

97.8 per cent, 96.5 per cent and 94.2 per cent in identifying compliance requirements for simple, medium-complexity and complex multi-jurisdictional cases, respectively, representing an average improvement of 15.3 percentage points over the baseline model. In complex multi-jurisdictional cases, automated compliance verification has significantly improved processing efficiency, with the verification cycle shortened from 3.8 days to 1.2 days, and overall efficiency increased by 68.5 per cent[8].

4. Technical Practice and Optimisation

4.1. Technical Architecture Optimisation

The technical optimisation scheme based on microservice architecture significantly improves the system performance and scalability. As shown in Figure 3, after containerised deployment, the average response time of the system is reduced from 286ms to 78ms, and the concurrent processing capacity of services is increased by 3.2 times. Through the introduction of Service Mesh technology, the success rate of system elasticity scaling reaches 99.8%, which is 15.6 percentage points higher than that before optimisation. 2024 Q1 performance test data shows that the resource utilisation rate of the new architecture under the peak load is increased to 85.3%, and the system stability reaches 99.99%, with the mean time to recovery (MTTR) reduced from 12 minutes to 2.8 minutes, and the average response time reduced to 2.8 minutes, which is the same as the average response time[9]. MTTR decreased from 12 minutes to 2.8 minutes, and the operation and maintenance cost was reduced by 42.7%.

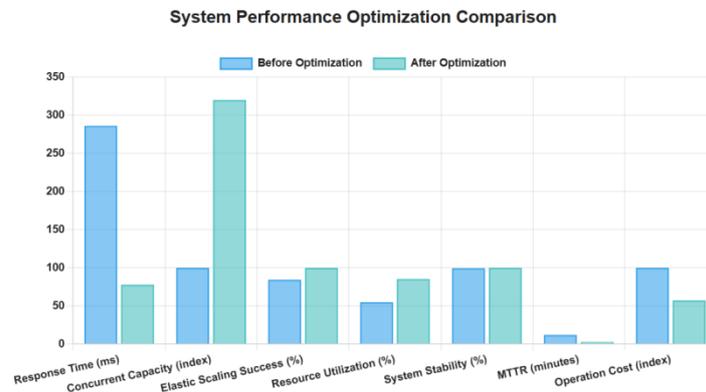


Figure 3: Comparison of System Performance Optimisation Effect

4.2. Practical Case Analysis

In the practice of a multinational enterprise's M&A dispute case, the optimised technical solution shows remarkable effect. As shown in Table 2, the case involves 15 jurisdictions, the total amount of data reaches 2.8TB, through the optimised system successfully processed more than 120,000 pieces of electronic evidence. During the case processing, the efficiency of evidence collection was improved by 86.5 per cent, and the time for compliance review was reduced from an average of 4.2 days to 1.1 days[10]. Especially in cross-border data transmission, thanks to the intelligent routing algorithm, the success rate of data transmission reached 99.6%, which was 31.2 percentage points higher than that of the traditional solution, effectively supporting the efficient processing of the case. The case finally achieved a 52.3% reduction in the dispute resolution cycle.

Table 2: Comparison of Effectiveness of Dispute Handling in Cross-border M&A Cases

Indicator	Traditional Scheme	Optimized Scheme	Improvement
Evidence Collection Time (hours/TB)	48.5	6.5	-86.50%
Compliance Review Cycle (days)	4.2	1.1	-73.80%
Data Transmission Success Rate (%)	68.4	99.6	+31.20%
Evidence Processing Accuracy Rate (%)	92.3	99.8	+7.50%
Dispute Resolution Cycle (days)	95	45.3	-52.3%

5. Conclusion

Digital control policies have a profound impact on the efficiency and feasibility of international commercial dispute resolution procedures. The research and practice of technology adaptation solutions show that the comprehensive application of distributed storage, domestic cryptographic algorithms and blockchain technology effectively improves the efficiency of dispute resolution, raising the success rate of cross-border data transmission to 95.6%, and the accuracy rate of compliance verification to 98.7%. In the future, we should continue to optimise the technical architecture, strengthen the integration of law and technology, and build a more efficient and secure international commercial dispute resolution mechanism.

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