Smart Courts: The Expansion of Technology in the Chinese Judicial System

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Abstract

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Abstract

In recent Covid-19 outbreak Chinese informationized judicial system provides reliable and efficient alternative platform for disputes resolution and judicatory justice. This article presents a comprehensive and in-depth examination of the Chinese judicial system's efforts and achievements in informatizing the judicial process. This article analyses and illustrates Chinese courts' approach to constructing smart courts based on a large volume of various judicial data collected through numerous platforms established under the lead of the SPC and the application of advanced information technologies represented by AI technology. Then, this article demonstrates the various intelligent instruments and functions that information technologies foster in judicial activities. In addition, this article is supplemented with extensive practical statistics and evidence to evaluate the effectiveness of Chinese smart courts. After exploring the Chinese judicial system's motive for promoting informatization in internal judicial reform, this article exposes the challenges and pitfalls that will accompany the current process of judicial informatization.

Key words: Judicial informatization; Chinese judicial system; Information technology; AI; Efficiency of judicial process

Introduction

Modernization will be impossible without informatization. The judicial informatization or construction of smart courts is the first step for China to move towards judicial modernization. The Chinese Supreme People Court (SPC) defined a smart court as constructing, operating and managing the whole judicial

process by adopting modern artificial intelligence (AI) technology and informatizing judicial proceedings, case management, and judicial services. A smart court closely integrates AI with practical judicial demands and can serve as an important engine and massive power to promote Chinese judicial reform. In recent Covid-19 outbreak Chinese informationized judicial system provide reliable and efficient alternative platform for disputes resolution and judicatory justice.

This article presents a comprehensive and in-depth examination of the Chinese judicial system's efforts and achievements in informatizing the judicial process. This article analyses and illustrates Chinese courts' approach to constructing smart courts based on a large volume of various judicial data collected through numerous platforms established under the lead of the SPC and the application of advanced information technologies represented by AI. Then, this article demonstrates the various intelligent instruments and functions that information technologies foster in judicial activities. In addition, this article is supplemented with extensive practical statistics and evidence to evaluate the effectiveness of Chinese smart courts. After exploring the Chinese judicial system's motive for promoting informatization in internal judicial reform, this article exposes the challenges and pitfalls that will accompany the vigorous process of Chinese judicial informatization.

Construction of Chinese smart courts

Technology revolution boosts smart courts

In Mainland China, the construction of smart courts has undergone equipment updating and technology iterations, gradually entering the 3.0 era of judicial informatization. One important feature of this stage is the all-round and full-process application of information technologies such as AI and deep learning. AI is not a new concept: at the Dartmouth Conference in 1956, "to make machines act in this way, that the way humans do", was come up with by an American computer scientist John McCarthy and his colleagues, which is regarded as AI. (Tencent Research Institute, 2017)

In the next 60 years, AI underwent "three ups and two downs". (Li, 2017) Researchers have been working unremittingly to develop AI that has mastered the thinking and reasoning abilities of humans. Although AI has intrigued the public, and human science and technology has been developing rapidly, there were few breakthroughs in the application of AI in the decades after the end of World War II. This barrier can be attributed to the two major pain points existing in information technology of that time: "data" and "hardware". (Li, 2017) If we compare AI to a heart, it is born with two deficiencies. One is that the quantity of data that could be allocated was too small: there was an "insufficient supply of blood". (Li, 2017) The other was that insufficient hardware resulted in the lack of computing power to resolve complicated problems: the "heart had insufficient strength". (Li, 2017) The two problems could not be solved until the Internet was extensively popularized, stemming the explosive growth of data, and the computing capability of computers reached a sufficient level, having doubled annually; at this point, the computing fabric experienced a revolutionary change. (Li, 2017)

The increasing accumulation of data and rapidly-developing hardware drove the silent AI to enter its third wave of development, which continues today. (Shahmin, 2019) With the driving forces of sufficiently massive data, powerful computing resources, advanced algorithms and many other factors, AI has developed enough to reform modern industry. The keywords occurring most frequently in the integration are the core breakthroughs of this wave of AI: "big data" and "deep learning". Judicial reform is benefitting from the thriving development of judicial big data and the wide application of information technology represented by deep learning. (Bhattacharjee, 2012) More specifically, the primitive accumulation of judicial data, the improvement of hardware performance and the effective application of AI serve as an important foundation and inexhaustible forces for building smart courts.

Emerging judicial big data in the Chinese judicial system

The notion and scope of big judicial data

Abundant judicial data resources serve as an important foundation for constructing information-based courts

in China. Scholars have different views on the concept and scope of judicial big data. From the perspective of judicial statistics, some researchers regard the data from cases tried by over 3500 courts across the country over more than 60 years as judicial big data; (Yan, 2014) from the perspective of data characteristics, some consider judicial big data to be a dataset formed in the process of rapidly capturing, managing and dealing with judicial information by using a new processing mode armed with an all-round, accurate, forward-looking, scientific capability of analysis, judgement, insight and optimization. (Wang, 2016) This author contends that judicial big data should be a dynamic concept. Massive data with substantial significance to the court, relevant parties and the public are formed in judicial practice; the courts store, disclose and excavate those data in an intelligent manner. After AI evaluation, the cumulated data evolve into different forms of datasets that can serve the judicial authorities, relevant parties and the public.

b. Primitive accumulation of judicial big data

Compared with traditional data processing technology, big data is much more than having greater data capacity. According to the International Data Center, big data is characterized by four remarkable features: large volume, variety, high velocity of data processing and low density of data value. With these features, Chinese judicial big data is a type of multidimensional, large-scale, traceable, electronic data collection covering all kinds of judicial activities by relying on the five following information platforms established by Chinese courts under the auspice of the SPC.

The data regarding judicial process.

The whole process of various judicial activities produces a large amount of dynamic information, for example, the number of days after receiving the pleadings that it takes the court to deal with the case; when the evidence should be submitted; the appearance of witnesses, the adjournment or postponement of the trial. In November 2014, the SPC established the China Judicial Process Information Online (*https://splcgk.court.gov.cn/gzfwww/*). Afterwards, all cities, regions and provinces across Mainland China gradually established unified sub-platforms for the disclosure of judicial process information. The judicial process platform allows interested parties to obtain access to various judicial process information related to cases dealt with by courts throughout the country. For example, parties can obtain the real-time information of their cases by only inputting their names and ID numbers with verification through mobile phone applications. Moreover, the platform is supplemented with supporting information such as relevant judicial interpretations, directory of judges, case introduction, and announcements of court hearings. The website also sets up the navigation of the systematic scene of the SPC's judicial service, which helps parties understand and utilize the relevant litigation process. By December 2019, the China Judicial Process Information Online received 130 million visits in total and aggregated a huge volume of judicial data while offering convenience to users.

The data regarding court hearings.

In September 2016, the SPC set up a website for the disclosure of court hearings to broadcast the trials by Chinese courts at all levels nationwide (http://tingshen.court.gov.cn/). The court hearing platform provides live streaming of selected court hearings at all levels across the country. By December 2019, the total number of live hearings broadcasted was close to 6 million, and the number of visits had exceeded 21 billion. These numbers show that the public pays close attention to live court hearings. This website also offers services including recording, broadcasting, and hot spot ranking. It is even more interesting to note that the public will post and share their favourite moments of court hearings on social networks, which supplies vivid judicial materials to popularize Chinese laws and the judicial system among the populace.

The data regarding all types of judicial documents.

The SPC's Provisions on the People's Court Publishing Judgements on the Internet officially entered into force in January 2014. Meanwhile, the SPC has established the Chinese Judgements Online to publish the effective judgements made by the Chinese courts at all levels (https://wenshu.court.gov.cn/). In 2016, the SPC further broadened the sphere of disclosed judicial documents to include all kinds of judgements,

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verdicts, payment orders, notices of rejecting complaints, decisions of national compensation, decisions of compulsory medical treatment, decisions of penalty execution and alternation, decisions of detention and penalty, mediation statements of civil public interest litigations, administrative mediation statements, and any other judicial documents that can stay or close litigation proceedings. Theoretically, Chinese courts publish any judicial documents online that may affect the substantive and procedural rights and interests of the parties. China Judgements Online is regarded as the most important platform in judicial big data. By December 2019, the quantity of judgement documents disclosed on the website reached more than 80 million and has been growing at the rate of 50,000 new documents per day. The number of visits to the whole website reached 40 billion. The earliest date of all judgement documents could be dated back to 1996.

The data regarding enforcement.

The SPC built two websites disclosing enforcement information in 2013, normalizing the collection, exchange and application of enforcement information and sharing enforcement information within all Chinese courts. (*http://zxgk.court.gov.cn/ and* http://jszx.court.gov.cn/) Meanwhile, the parties in action are able to obtain access to information related to enforcement registration, enforcement measures and enforcement personnel through this platform. Most importantly, it can disclose the information of any person who maliciously resists enforcement as a punishment. Moreover, this platform also supplements the Chinese credit reporting system with relevant enforcement information. By December 2019, the number of dishonest persons who resisted enforcement and were subsequently disclosed at http://jszx.court.gov.cn/ was close to 6 million. This website has another vital function: to auction executed property online. The online auction system was officially established on March 1, 2017, and by December 2019, the number of judicial auctions organized on this website had exceeded 460,000, and the volume of transactions had reached 994.395 billion RMB. Before the establishment of this function, some Chinese courts had already started to experiment with online judicial auctions through popular e-commerce service providers, such as the Alibaba and Taobao websites. Enforcement judges will also sometimes organize live online auctions in person, similar to TV sales stars, to promote judicial auctions.

Information on litigation service.

In 2015, the SPC set up a litigation service network whose major functions cover information queries, litigation guidance, online registration, submission and exchange of documents and material, online evaluation, complaints, appointments, etc. (http://ssfw.court.gov.cn/ssfww). Chinese courts actively publish case flows and electronic files from litigation to support litigation service networks. Overall, Chinese courts attempt to share resources between litigation service networks with the abovementioned four platforms (judicial process platforms, judicial document platforms, enforcement information platforms, and court hearing platforms) and established case flow management systems and online office systems. These instruments and technologies greatly facilitate information sharing among judges, parties and other involved persons and thereby streamline judicial proceedings.

The SPC has taken a pioneering and exemplar role by establishing the abovementioned five types of platforms. Afterwards, all Chinese courts at all levels followed the SPC's footsteps to establish and publish their own datasets. By the end of 2018, 82.67% of Chinese domestic courts had established litigation service networks. Moreover, more than 44% of the courts had developed computer apps or WeChat Mini Programs as new media installed on people's smartphones to facilitate litigation services. The primitive accumulation of data regarding every aspect of all varieties of judicial activity and originating from Chinese courts at all levels will approach a staggering level and constitute an enormous data pool for constructing smart courts. The exchange, transfer and sharing of these data and between different datasets bring the whole Chinese judicial system into the new information era. The exposure of all kinds of judicial data is the first step taken by the Chinese judicial system to utilize information technologies to make transparent judicial activities, streamline litigation processes and enhance public supervision. Furthermore, massive data and various platforms provide effective instruments and abundant research resources for the SPC to coordinate and unify Chinese judicial practice and explore directions for further evolution, which constitute the cornerstone for constructing smart courts.

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Informatizing judicial proceedings and case management

The process of informatizing Chinese courts is the process of deepening cooperation between innovative information technology and judicial practice. In the early days of constructing Chinese smart courts, the application of information technologies was restricted to transferring the operation of some procedural matters from offline to online. This achieved the primitive accumulation of judicial data and relevant information. In version 2.0 of constructing Chinese smart courts, emerging technologies such as character recognition, speech recognition, and live streaming made the informatization of the whole litigation process possible. Version 3.0 of such construction further deepened the application of technologies to all kinds of judicial activities and moved the whole litigation process online. In other words, with the help of AI, such as deep learning and other emerging technologies, version 3.0 attempts to seek breakthroughs by promoting the automatic production and corresponding supervision of relevant judgement documents connected to cases with similar merits. Relevant innovations and intellectualization constantly emerge. From case association, the presentation of laws and regulations, pushing similar cases, and the automatic production of legal documents including judgement documents and then moving on to intelligent legal research and judgements, the establishment of a judgement model and an early warning of different judgements for cases with similar merits, the impacts and application of information technologies based on AI are becoming increasingly obvious and versatile in every aspect of the judicial process.

Specifically, regarding legal research, semantic search and legal questions and answers based on NLP (natural language processing) and deep learning make the search services more accurate. With respect to electronic evidence, technologies such as NLP, TAR (technology assisted review), machine learning and predictive programming greatly enhance efficiency when circulating electronic evidence and discovery procedures. (Tencent Research Institute, 2017) Considering the aspect of evidence verification, Blockchain, which features "tamper-resistance, decentralization and joint verification", is extensively used in data storage and evidence notarization. Chinese courts have started to recognize TSA-format time-stamped certificates affixed with digital fingerprints and authoritative time produced by reliable third-party time-stamp service agencies established by national information centres. (Meng, 2019) With respect to case circulation, mature speech and image recognition technologies make the simultaneous generation of electronic archives and profound applications possible, with powerful support from court private networks and open cloud platforms. In the process of enforcement, many courts have integrated the databases of national administrative agencies for industry and commerce, taxation, land, housing and construction, banks and e-commerce; they have built all-dimensional management systems of trace analysis for the executes; and courts have executed property assessment through big data analysis and visualization, supplying monitoring and early warning of executes' unusual activities. Judicial big data has become an important sub-database of the national big data system. (Yu, 2015) The cross-fertilization between the Chinese judicial system, the big data system and the development of information technologies is also a prospect. The abovementioned system provides technical support to promote the efficiency of all judicial proceedings. Meanwhile, the Chinese judicial system provides platforms where relevant technologies can practice, evolve and make breakthroughs. The technologies necessary for the construction of smart courts need to be verified in judicial practice. Chinese courts and relevant judicial activities provide the best venue for such applications, with timely feedback and improvement advice. Diversified support of judicial instruments by information technologies can be categorized into the following four functions:

Information inquiry and push functions

In trial, access to associated information can help judges improve the efficiency of the lawsuit, reduce the risks of sham and malicious lawsuits, and help executors accelerate the enforcement process and improve the quality and efficiency of the execution. The associated information query can provide judges with information including related cases, associated parties, and related processes. For example, with the help of this instrument, judges are able to browse litigants' previous litigation records, ongoing litigation cases and other information to avoid repeated and sham litigation. (Tang, 2017)

Function connecting legal provisions and similar cases

The intelligent delivery of relevant legal provisions and similar cases to judges can enhance the efficiency of judgements, unify judicial proceedings and judgements, and maintain judicial impartiality. By 2019, 2,703 courts in China had been armed with instruments automatically connecting to legal provisions, accounting for 77% of the courts across the country. (Chen, 2019) A total of 2,061 courts had been equipped with push instruments for cases that will send case files with matching elements automatically to judges, accounting for 58.72% of all Chinese courts. (Chen, 2019) Courts located in 15 provinces in Mainland China boast of the abovementioned functions. (Chen, 2019)

Function generating judicial documents

Judicial document writing, as the most burdensome and difficult component in judges' judicial work, is also an important target of smart court construction. In the early days of informatization, the document generation system could only provide a document template for simple procedures. With the development of AI technologies, Chinese courts have developed auxiliary systems generating all varieties of judicial documents to relieve judges of this repetitive and rigid work. The relevant systems mainly consist of two types. One is the automatic system generating procedural and standard judicial documents. By the end of 2018, a total of 1,877 courts in China were capable of generating standard judicial documents in batches, accounting for 53.48% of the courts across the country. (Chen, 2019) Courts located in 22 provinces have been provided with this function. The second type is the automatic generation of a rough draft of substantive judicial documents. By the end of 2018, 2,815 courts were able to automatically generate elements of civil and administrative judicial documents, including the cause of action, party information, litigation claims and merits, accounting for 80.20% of the courts across the country. (Chen, 2019) A total of 2,707 domestic courts were able to automatically generate elements of criminal judicial documents, such as procuratorates, defendant information, defendant criminal records, case facts, and charges, accounting for 77.12% of the courts across the country. (Chen, 2019)

Function predicting judgements

Over the years, Chinese courts have achieved judgement prediction, starting with simple cases and relying on knowledge atlases and technologies, such as judicial big data and the automatic extraction of judicial elements. Concrete progress has been made in highlighting the difference between real judgements and predictions. For example, the Shanghai auxiliary system for intelligent criminal case handling constructs a neural network model of penalty measurement based on a big data analysis of criminal cases through machine learning, semantic recognition and manual annotation to provide a reference for penalty measurement to procurators and judges. (Ge, 2018) The Beijing "smart judge" system provides different auxiliary functions in accordance with the cause of action in civil cases, for example, providing intelligent calculation services for motor vehicle traffic accident cases; property partition modelling services for divorce cases; and principal and interest calculation functions for debt cases. (Zuo, 2018) With these specific tailored small instruments, judges can more efficiently produce judicial documents.

Effectiveness assessment of Chinese judicial informatization

Rapidly accumulating judicial big data supplies abundant "blood" to build Chinese smart courts. Advanced information technologies, which are represented by AI, play a key role in maximizing the value of judicial big data and vitalizing the potential of Chinese smart courts.

Practical results of informatized judicial proceedings

Currently, 3,519 courts and 9,279 tribunals in Mainland China are interconnected through private networks. (Wang, 2016) Chinese courts at all levels automatically report data regarding judicial process and judgement documents to the judicial big data platforms established by the SPC at a frequency of once a minute or greater. The five abovementioned judicial big data platforms supply sufficient information disclosure for the courts and parties, as well as rich data support for the development and application of all kinds of judicial information technologies. Based on this fact, achievement of the informatization of the Chinese courts is satisfactory, mainly lying in the establishment of Internet courts, the noticeable enhancement of litigation

efficiency, and the emerging smart trial system supported by versatile intelligent trial instruments.

Internet Courts

Internet courts are Chinese trial courts specifically established by the SPC to hear cases regarding the Internet, including e-commerce disputes, Internet service disputes, Internet financial disputes, Internet intellectual property disputes, Internet torts, Internet pro bono cases, and Internet administration actions. On August 18, 2017, the Hangzhou Internet Court was officially founded, specifically to hear six types of civil and administrative cases related to the Internet at the first instance within the jurisdiction of the courts located in Hangzhou, Zhejiang Province. One year later, the Beijing Internet Court and Guangzhou Internet Court were established in September 2018. The SPC published the Provisions on Issues over the Case Trial by Internet Courts (Fa Shi [2018] No.16, hereinafter referred to as the "provisions"), stipulating provisions regarding the jurisdiction of Internet courts, online litigation, electronic evidence discovery, etc. The establishment of Internet courts represents a milestone in China's judicial reform that meets the judicial demands in the era of the Internet and integrates the existing achievements in constructing smart courts. Additionally, it is a solid step for the Chinese judicial system towards exploring corresponding and supporting procedural rules and regulations for online judicial proceedings, producing significant social and practical effects. Overall, the greatest advantage of Internet courts is that they improve the trial efficiency for resolving disputes and significantly reduce the cost of litigation. In two years, the Hangzhou Internet Court dealt with more than 20,000 cases in total, with the rate of online registration reaching up to 92%; trial times and trial period were reduced by an average of 66% and 25%, respectively, compared with traditional offline trials; the court made judgements in 99% of registered cases; and the rate of voluntary performance reached 98%. (Meng, 2019) The Beijing Internet Court received 34,263 cases in a year and wound up 25,333 cases. (Meng, 2019) It made judgements in 98.3% of registered cases, and its ratio of voluntary performance has reached up to 98%. (Lu, 2019) Among the courts across Beijing, its comprehensive trial quality and efficiency is ranked highest. Statistics clearly show that the online dispute settlement model greatly decreases the litigation cost and increases procedural efficiency. The application rate of the summary procedure at the first instance in the Beijing Internet Court has reached up to 95.2%; the average trial time is only 37 minutes; the complete judicial proceedings take only 40 days on average; and the cost per person per case saves approximately 800 RMB on average, including 16 hours of travel. (Xie, 2011) For Guangzhou Internet Court, the average trial time of the cases completed is 46 minutes, and the time taken for all judicial proceedings can be reduced by 80%. (Dong, 2019) These remarkable improvements completely fulfil the desire for a "low-cost and quick trial" in online judicial dispute resolution.

Litigation efficiency

In addition to Internet courts, traditional courts have also experienced a noticeable improvement in litigation efficiency with the support of information technologies. The caseload of Chinese national courts is exceptionally large, and the whole Chinese judicial system is overwhelmed. The number of cases in Chinese national courts is exceptionally large; for example, in 2017, the average number of cases administered per judge in the Nanshan District People's Court in Shenzhen, Guangdong Province, was approximately 437 (Chen, 2019b). Taking the People's Court of Yantian District, Shenzhen as an example (hereinafter, Yantian Court), it is the only court that has the jurisdiction over administrative cases in the city of Shenzhen. In 2017, its caseload was 2.73-fold that in 2015, (Chen, 2019) which means that it is impossible for the rapidly increasing demand for judicial productivity to be solved by simply expanding human resources. Based on a series of administrative documents, including the 5-Year Development Plan for Construction of an Information-based People's Court (2018-2022), Opinions of the Supreme People's Court on Accelerating Court Construction, and the 3-Year Plan for Construction of the Shenzhen Information-based Court (2017-2019), the Yantian Court is experimenting with a practice mode called the "one-track paperless case management system". After the pilot implementation was initiated in May 2018, the strengths of the new case management system became increasingly obvious. First, it relieves judges and their assistants from complicated and time-consuming case-related filing work. The Yantian Court has finished 1,033 electronic archives within the first 3 months of paperless case management, saving approximately 1,200 working hours compared with traditional filing.

(Wan, 2019) Second, the trial performance has been made faster and improved. The new case management system has achieved a 100% automatic generation of judicial documents related to procedural matters. (Wan, 2019) The number of automatically generated documents reached 36,991, and such documents were delivered by the electronic service platform 4,711 times. (Wan, 2019) Third, the judicial act is becoming increasingly standardized. In each process, judges' electronic operations are transparent and traceable. Fourth, litigation service has been upgraded by supplying online services to the involved parties and other litigation participants. (Wan, 2019)

Efficiency of versatile intelligent trial instruments

In practice, the adoption of AI at every stage of judicial proceedings is growing vigorously. Examples are countless. The Shanghai Higher People's Court developed an intelligent auxiliary system for criminal case handling (commonly known as the "206 project"), whose core functions include guidance in evidence standards, legality and compliance verification for single evidence, and review and judgement of evidence chain integrity. (Yan, 2017) Courts, procuratorates and police departments located in Huaxi District, Guiyang City, Guizhou Province jointly piloted the big data case handling system, incorporating an application module providing standard guidance for evidence that normalized the evidence forms transferred in everyday cooperation between these authorities. (Wang, 2017) Guangzhou Intermediate People's Court developed an intelligent penalty measurement and judgement system. After comparing and taking reference of over 3 million similar cases, this system provides a graphical analysis and data reference for the range of penalty measurements in criminal cases. (Shang, 2018) Shenzhen Futian People's Court and Alibaba Company worked together to develop an intelligent financial dispute adjudication system, which can automatically generate information and litigation materials related to the case at hand. (Liu, 2017) These intelligent systems and programs not only greatly increase the efficiency of case resolution by facilitating the work of judges by providing rapidly delivered, transferred, and automatically generated judicial documents but also enhance cooperation and standardization between different legal authorities. Taking the intelligent penalty measurement system adopted by the Hainan court as an example, by December 2017, the system had been used more than 550,000 times. (Huang, 2017) A total of 307 criminal judges from 25 courts prepared 1,423 tables of penalty measurement through the system. (Huang, 2017) A total of 1,072 legal documents, including 773 judgements and 299 other judicial documents, were generated by intelligent systems. (Huang, 2017) These systems reduce by 50% the time judges take to resolve standardized penalty measurement cases, by 70% the time needed to prepare judgement documents, and by nearly 90% the time needed to make procedural legal documents. (Huang, 2017) In conclusion, these systems significantly reduce the workload of judges dealing with penalty measurement, effectively alleviate the prominent contradiction between rapidly increasing caseloads and limited human resources, and decrease the number of situations in which cases with similar merits receive different judgements.

Accelerating internal judicial reform in constructing smart courts

After 2010, the Chinese judicial system initiated a series of intensive judicial reforms aimed at improving judicial institutions, establishing judicial responsibility and staffing systems, optimizing judicial proceedings and increasing the transparency of judicial activities. (Feng, 2015) The application of information technologies fuel China's judicial reform from various perspectives. Inside the Chinese judicial system, judicial reform starts by adopting a strict judge selection process; building a judiciary group consisting of judges, judges' assistants and clerks leads to a comparatively steady number of judges and an adjustable group of judges' assistants and other trial affiliated staff. With the application of information technologies to courts' everyday work, constructing smart courts has also had a profound impact on the traditional organization of Chinese judicial human resources.

In recent years, electronic office systems have been popularized in courts at all levels throughout the country. In 2016, the court's private network had fully expanded to more than 3,500 courts and more than 10,000 tribunals and maritime tribunals all over the country, basically making it possible to provide online approval of all affairs, online management of all judges and online circulation of all cases. (Li, 2018) The human resources information management system radiating to four levels of courts in Mainland China provides a

basis for China's internal judicial reform.

As an important part of judicial system reform, China's internal judicial reform is beneficial for alleviating the contradiction between rapidly increasing caseloads and limited human resources. China's internal judicial reform mainly refers to the reform of the court staffing system, the organization of judges' assistants and clerks and so on. In addition to streamlining and increasing the efficiency of judicial proceedings, constructing smart courts boosts the reform of the Chinese court staffing system and human resources organization. First, intuitive and easily recorded case information and various statistical data make it convenient for courts to reasonably allocate judges' assistants. Second, the electronic office system makes judicial staff work traceable, which is helpful for establishing an objective evaluation system for all judicial staff.

Judicial big data improve the distribution of judicial human resources

By December 31, 2017, the platforms for judicial big data management and services established by the SPC had collected information related to 133 million cases across China, and thus the whole dataset had evolved into the world's largest trial information dataset. The nationwide judicial data platforms include and constantly monitor important data and statistics that can be used to distribute human resources, such as the case closing rate of a court in a particular period, the distribution of cases by subject matter, the appeal rate of trials following their first judgement, the real-time workload of each trial tribunal and judge, the duration and progress of trialled cases and so forth. Before the construction of smart courts, these kinds of judicial data could only be collected and reviewed in the annual reports of the courts, which only include rough numbers of received and closed cases as a whole court, without the data of each trial tribunal, judge and case.

The construction of smart courts makes accurate acquisition of real-time data possible, thus providing a reliable basis and reference for distributing judges and their assistants. The Chinese court staffing system reform confirms the number of judges in the courts at all levels and attempts to adjust the number of judges' assistants according to changing caseloads and court capacity. Based on that, the electronic office platform is capable of figuring the number of real-time cases dealt with by each tribunal or judge, and the big data management platforms may calculate the working hours needed to handle a case and make the specific work content visual. Based on consideration of the abovementioned data, courts can decide how many assistants the judges need according to their caseloads or further determine the kinds of qualifications and professional skills required for their assistants so that the courts can adjust recruitment qualifications or train existing assistants. Courts that have not achieved "an assistant per judge" allocation can also dynamically allocate their limited resources of judges' assistants in light of real-time judicial data, allowing already overwhelmed tribunals and judges to receive timely human resource support.

The online office system provides objective evaluation standards

All-dimensional judicial data provide accurate performance indicators by offering quantitative and detailed data support. The online system integrates judges' and judges' assistants' personal information with their work data, developing a multidimensional evaluation service specifically tailored for courts, judges and judges' assistants, etc. In the online office system, each worker sets up his or her account and can operate it independently, and every activity and movement within his or her account is traceable. Previously, the judicial staff's performance could only be measured roughly through the number of allocated cases, appeal rate, retrial rate, etc. The current electronic office system makes the real-time trace of a specific case possible and makes each movement and operation regarding a specific case apparent and visible, which enriches performance evaluation standards for judicial staff. (Qu, 2016) Different courts are experimenting and developing their own standards by utilizing these multidimensional data. For example, courts at Guizhou Province extracted, specified and simplified the elements at every stage of judicial proceedings and built a fundamental judge performance evaluation framework consisting of the "judge workload evaluation system", "judge trial quality and efficiency evaluation system", "comprehensive judge workload evaluation system" and "comprehensive judge evaluation system".(Gui, 2017)

In addition, most Chinese courts currently still take the opinions of presiding judges and judicial tribunals

as the basis for evaluating the performance of judges' assistants. Under the reformed Chinese court staffing system, judges' assistants not only play an affiliate role in conducting judicial activities but also are judges in training and will be promoted to judges after an exam and selection. Therefore, evaluation of their performance should not be affiliated with that of the presiding judge and judicial tribunals. Courts can establish an independent evaluation system for judges' assistants and regard it as a vital component of intelligent court internal management systems. The independent evaluation of judges' assistants is not hard if it is based on clear evaluation indicators and accurate evaluation data extracted from the current traceable electronic office system. The evaluation system can also constitute a vital basis for diversified promotion and evaluation of judges' assistants.

Internal case evaluation and review in smart courts

Previously, Chinese courts relied on extensive human resources to supervise and review case files to prevent trial risks. The rapidly increasing caseloads and massive judicial data made manual evaluations and reviews insufficient for providing supervision. The informatization and construction of smart courts can help Chinese courts solve this problem. For example, Hebei Province innovatively researched and developed a system for preventing legal risks that may occur in judicial proceedings. The Hebei Higher Court defined and sorted out 125 points of risk for all problems arising from case supervision in past years and carries out an automatic intelligent inspection according to these dimensions, including information input, data quality, process integrity, material completeness and procedural legality. (Ding, 2015) Intelligent supervision and inspection greatly improve the timeliness, accuracy, and comprehensiveness of data management and control and relieve judicial staff from error-prone and burdensome manual review. Now, a regular check on all the judicial case files of a large city only takes10 minutes, significantly saving judicial management costs and improving the comprehensive efficiency of trial management and quality of case handling. (Ding, 2015)

Pitfalls and challenges in constructing smart courts

While Chinese courts have been actively amplifying informatization of the judicial process, they have encountered numerous pitfalls and challenges, some of which are still severe and unsolved.

Increase sharing and connection of judicial big data

The construction of smart courts and the application of AI technology must be based on a large volume of complete and accurate judicial data. The "bigness" of judicial data is a premise for AI technology to be deeply developed and accurately applied. If judicial data cannot be collected, shared and connected at a national level, the significance of intelligent justice will undoubtedly be limited. (Tang, 2017) Currently, different provinces in Mainland China have established independent operational interfaces and systems for their own intelligent judicial proceedings and case management, such as the "12368" platform of the Shanghai court, the electronic court system in Jilin Province, and the intelligent court system of Zhejiang Province. Most courts developed their own intelligent judicial instruments to facilitate the work of their staff. These information systems and intelligent instruments may have similar functions but with different settings. Even though the judicial databases of different provinces are to some extent connected under the auspices of the SPC, information integration between these independent databases has experienced challenges; specifically, tailored intelligent instruments are not communal. The data exchange between the different court databases for different provinces is not without barriers. These useful information platforms and intelligent instruments do not cover all Chinese courts. If the barrier of information circulation is not overcome, these independent databases will be just "information islands" and cannot support judicial big data. Therefore, courts should make an effort to solve difficulties in data sharing and availability, including between the judicial system and other information providers, improving the use of data resources in the following dimensions.

First, data resources should strengthen information infrastructure support. Whereas the Chinese courts show remarkable advantages in the efficient construction and velocity of network and hardware facilities, the existing information infrastructure still does not fully meet the requirements for data exchange and sharing nationwide. The deficiencies are more obvious in the trial courts in rural areas. Commentators suggest that the Chinese judicial system should build a nationwide information sharing website consisting of five network

systems: "new mobile private network, court private network, mobile private network, exterior private network, the Internet and confidentiality involved internal network". (Hu, 2019) Second, data resources should enhance data sharing and maximize the interconnection of the court both internally and externally. Internally, courts should enhance information sharing and support among internal departments, such as case registration, trial, enforcement, judicial appraisal, and judicial auction. Externally, it is necessary to offer a collaborative interface for different judicial scenarios, such as promoting the connection between commutation and parole case data and management platforms, making the road traffic accident data sharing channel available to the public security department, promoting the integrated processing platform for road traffic accident disputes, and even better connecting criminal and civil case data. (Hu, 2019)

Judicial data and information security

In the era of big data, interconnected judicial information not only brings great convenience to the judicial system but also brings about a systematic and uncontrollable risk of information disclosure. It is inevitable that informatizing smart courts requires technical support outside of courts, which will undoubtedly confront the related AI systems with several risks. Therefore, "ensuring information security" and the "informatization of courts" are equally important in the construction of smart courts. The security of judicial information includes two aspects. One is to ensure that the primitive information acquired and stored by the court is genuine, valid and has not been tampered with. The other is to ensure that confidential judicial information is not disclosed or stolen. All courts are facing the difficult problem of keeping the information in the platform and system secure. Many courts have contributed their ideas for maintaining information security. For example, the Harbin intermediate court assigns archive scanning to a professional team under a confidentiality agreement. The court requires the scanning of files to be completed in the same day. In other words, the team has to scan and return the files on the same day to avoid information disclosure. (Li, 2017) Some courts seek resolution in the system itself. For example, courts in the province of Inner Mongolia built a security exchange platform as a barrier between internal networks and external networks, enhancing the security of the court information system. (Liu, 2017) Efforts made by a single court are obviously limited and primary, and even too formalized in the current judicial system, the problem of information security needs more centralized and standardized regulation.

The SPC is advised to adopt standardize security requirements, judicial staff should be educated to ensure their awareness of confidentiality issues, information protection technologies require upgrading, and the management of information security should be enhanced. The relevant efforts can be carried out from the following dimensions. (Tan, 2019) First, the SPC should establish relevant criteria for system security and more strictly examine the qualifications of technical resource providers outside of the court system. (Tan, 2019) Moreover, AI applications should not be adopted until they have passed certification showing that they meet national security protection standards. Second, numerous Chinese high courts (courts one level lower than the SPC) should take the responsibility for establishing an information application and monitoring centre; supervising centralized management, information backup, and lower courts' reports; and recognizing and analysing the reported information, thus generating judicial statistical data. (Tan, 2019) In addition, SPC can provide sharing and flexible allocation of information resources by pooling these resources, including computing, storage, network, and security, thereby promoting resource utilization. (Tan, 2019) The risk of judicial information security will continue for years and will never be completely eliminated. Information security is a serious problem in current Chinese society beyond judicial areas. Developing technologies will constantly bring solutions and new challenges to information security. (Arruda, 2017) Chinese courts should take cautious steps when expanding the volume of judicial data and the relevant data exchange and sharing.

Specifying the boundary of intelligent instruments

In judicial practice, some courts evaluate a judge's performance according to the judgement result predicted by the legal AI system. (Gao, 2018) In other words, in these courts, a judgement that is not in line with the intelligent prediction result will receive a warning or may affect the evaluation of the judge's performance. Clearly, this approach goes beyond the border for application of the legal AI system. In addition, the overuse of the AI system to judge complicated cases will encroach upon judges' subjective initiative and discretion

and does not comply with the objective requirements of judicial independence and judicial responsibility. Currently, there is no clear boundary for when to apply information technology in judicial practice. It is suggested that the relationship between intelligent instruments and judicial staff be more clearly defined in the construction of smart courts. (Tan, 2019)

The development of AI is divided into weak AI periods, strong AI periods and even super AI periods. (Tan, 2019) Weak AI refers to a system that only imitates human intelligence; strong AI refers to a system that is armed with human intelligence in all areas; and the super AI refers to a system that outperforms human intelligence in all areas. (Tan, 2019) Judicial AI at the present time is in the weak AI stage. The logic under which the legal AI system functions is making a correct summary of the behavioural regularities implied in a great number of judicial acts and then providing a correct and reasonable imitation. It can not only effectively alleviate the contradiction between rapidly increasing caseloads and limited human resources but also reduce the errors or deviations existing in judicial acts due to individual factors. In judicial activities, the AI system and litigation participants mutually influence each other. AI imitates the judge's behavioural pattern and law, whereas judicial reformers and participants hope to make judicial acts more standardized and accurate through the AI system. The relationship between AI and judicial personnel is not competitive but one of mutual assistance, guidance, correction and monitoring. The judicial judgement process is a combination of natural rationality, human rationality, value judgement, and human perceptual factors. In the implementation of the judgement process, such human rationality and perceptual factors can only originate from judges who are trained in the law and have abundant experience of legal theory and practice and not from AI. With different working mechanisms and acting modes, AI and judicial personnel can be integrated with integrity. Technologies will constantly develop and upgrade to take on an increasing number of jobs within judicial activities, but they should not change the substance of the judiciary. The whole judicial system should maintain vigilance on overuse or overreliance on AI systems and intelligent instruments. The AI boundary will be an increasingly rigorous subject in our future research.

Preventing algorithmic bias by legal AI systems

For legal AI systems, algorithmic bias is inevitably a major challenge. It affects the accuracy of decision-making and is even more likely to fatally damage judicial fairness and justice. Therefore, it is essential to intensify supervision regarding the legal AI system algorithm. To be specific, the relevant supervision should at least cover the algorithm managing judicial data sources and its implementation effects. Data-driven discrimination is one of the most important causes of bias in the AI algorithm. (Opsomer, 2009) Supervision of the data source starts with scrutinizing data input, including data samples and case elements. Meanwhile, a long-term mechanism for supervising and managing data accuracy should be set up to strictly control data quality. Moreover, the regulation of the algorithm should be carried out in two dimensions. Currently, the operation of the algorithm works more like a "black box"-people can obtain the results but are unable to unveil the process behind the deep learning. (Ma, 2019) In this case, we could supervise the complete process for algorithmic rule design. At the same time, we must acknowledge that no matter how hard we work to strengthen the supervision of the algorithm, it is impossible to completely eliminate the risk of bias arising from the mechanical quantification of the case in the algorithm's rules. From the perspective of the supervisory sphere, not only the algorithm design should be supervised but also the algorithm products and other relevant applied products. In other words, the supervisory responsibility of the court is not limited to the stage of algorithm design but includes the process of inserting the algorithm into the intelligent system and the process of applying the intelligent system in judicial practice. Then, the application and results of the algorithm will eventually be tested and examined in judicial practice.

V. Conclusion

In the process of constructing smart courts, the Chinese judicial system has achieved the most complete network coverage, the biggest data storage, the strongest openness and the most advanced intelligent technology support. It represents Chinese wisdom in the judicial civilization in the information era. Without any doubt, smart courts boast a superiority that traditional courts do not have. The advantages not only include facilitating the work of judges with diversified trial support instruments, greatly increasing the effi-

ciency of judicial proceedings, and offering disputants with versatile and more accessible judicial services but also providing a more accurate and objective evaluation system for judicial internal reform. Smart courts not only alleviate the troublesome contradiction between rapidly increasing caseloads and limited human resources but also provide unlimited possibilities for AI development and application. However, people must be clearly aware that the rationality of information technologies should not be exaggerated. (Long, 2019) In the subsequent stable period of court informatization, the Chinese judicial system should promote data opening and sharing to strengthen judicial big data, emphasize information and data security, specify the boundary of intelligent instruments, and avoid algorithm bias in the legal AI system. Additionally, the SPC should consider setting up more formal, standardized and comprehensive criteria for judicial informatization to secure Chinese smart court development.

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