

HUMAN-CENTRIC OR EFFICIENCY-DRIVEN? COMPARATIVE LESSONS FROM AI IN CIVIL JUSTICE ACROSS THE EU, CHINA, AND SINGAPORE

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ABSTRACT: Artificial intelligence is rapidly reshaping civil justice systems worldwide. While digital technologies have long been used to enhance court efficiency, the integration of AI into judicial decision-making and case management raises persistent concerns regarding transparency, procedural fairness, and judicial accountability. Existing scholarship, however, broadly examines AI governance within individual jurisdictions, often focusing on regulatory frameworks or specific institutional experiments, without systematically comparing how different civil justice systems embed AI within their procedural and governance structures. This article addresses this gap through a comparative analysis of AI-enabled civil justice in three contrasting jurisdictions: the European Union, China, and Singapore. Rather than assuming convergence toward a standard model of AI-driven justice, the article conceptualizes AI integration as an institutional design problem shaped by procedural values, governance arrangements, and capacity constraints. Methodologically, the study adopts a qualitative comparative approach, drawing on legislative texts, institutional reports, and existing empirical evaluations. The analysis reveals three distinct institutional logics. The EU prioritizes human-centric procedural safeguards and accountability, often constraining the scale and speed of AI adoption. China adopts an efficiency-first model of judicial modernization, embedding AI deeply into court infrastructure to enhance capacity and consistency, while narrowing opportunities for procedural contestation. Singapore occupies an intermediate position, pursuing pragmatic, governance-driven innovation grounded in professional responsibility and incremental adoption. Sum, the article demonstrates that there is no one-size-fits-all model and that AI redistributes procedural risk across participation, accountability, and efficiency in institutionally path-dependent ways.

KEYWORDS: AI in civil justice; Human-centric AI; efficiency-driven justice; EU; China; Singapore.

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1. INTRODUCTION

Artificial intelligence (AI) is increasingly being introduced into civil justice systems to address mounting pressures from delays, costs, and expanding caseloads. Courts across jurisdictions are experimenting with algorithmic tools to support core judicial functions, including case management, procedural standardization, judicial drafting, and outcome prediction (Úlehlová, 2025, p. 540). These developments have generated sustained debate. Proponents highlight efficiency gains, consistency, and improved access to justice (Masoudi & Yarahmadi, 2024, p. 204), while critics warn that automation may erode foundational procedural values such as participation, transparency, and judicial accountability (Hendrickx, 2025, p. 2). Much of the existing literature frames this tension as a choice between human-centric justice and efficiency-driven reform. This binary framing, however, obscures how AI is actually embedded within civil justice institutions.

A growing body of scholarship addresses AI in courts through ethical principles, regulatory safeguards, and technical design requirements, particularly focusing on transparency, explainability, and human oversight (Kim & Durrie, 2025, p. 2). While these approaches offer important normative guidance, they often assume that AI operates within a largely neutral procedural environment in which risks can be mitigated through better rules or system design. This assumption overlooks the fact that civil justice systems are profoundly shaped by legal traditions and governance structures that condition how adjudication is organized, how authority is exercised, and how procedural risks are distributed.

This article proceeds from the premise that AI does not merely assist adjudication but also interacts with existing institutional arrangements, shaping both its effects and its limits. Identical or similar AI tools may therefore function very differently across jurisdictions, even where normative commitments appear comparable. Variations in AI governance should not be understood simply as differences in regulatory maturity or policy preference, but as reflections of deeper institutional constraints that define how far efficiency can be pursued without altering the character of civil justice.

Despite this, much comparative literature implicitly assumes convergence toward a shared model of AI-enabled justice, differing mainly in speed or intensity of adoption. Reform debates also frequently suggest that tensions between efficiency and procedural fairness can be resolved through increasingly refined safeguards. Both assumptions are problematic: they underestimate institutional constraints and overstate safeguards' capacity to neutralize the trade-offs inherent in automation.

To address these issues, this article undertakes a comparative analysis of AI-enabled civil justice in three contrasting jurisdictions: the European Union (EU), China, and Singapore. These systems are often portrayed as representing distinct approaches to judicial digitalization. Rather than treating them as points on a linear trajectory, this article analyses them as distinct institutional configurations shaped by different conceptions of adjudication and governance.

Adopting a comparative institutional perspective, the analysis focuses on how AI is embedded within civil justice systems, with particular attention to underlying values, procedural risk-management mechanisms, and the relationship between efficiency gains and institutional capacity. This approach enables the identification of recurring patterns and trade-offs without presuming convergence or normative hierarchy.

2. THE DUAL IMPERATIVES OF HUMAN-CENTRIC AND EFFICIENCY-DRIVEN AI IN CIVIL JUSTICE

2.1. Why civil justice systems must balance between procedural rights and systemic efficiency

Civil justice systems are structured around a fundamental duality between procedural rights and systemic efficiency. Courts must safeguard core procedural rights because these rights underpin fairness and legitimacy (Quintanilla, 2018, p. 115), while also ensuring that dispute resolution remains timely, affordable, and institutionally sustainable (Hylton, 2023, p. 408). This tension is not ideological but structural: adjudication must simultaneously justify authority through participation and manage disputes at scale. The integration of AI into civil justice sharpens this inherent tension, exposing the limits of reforms that privilege either human-centric safeguards or efficiency-driven design alone.

Procedural theory explains why rights-based guarantees are central to adjudication. Courts derive legitimacy from participation, reason-giving, and the opportunity to contest outcomes (Solum, 2004, p. 190). Fuller's conception of adjudication as governance through argument and justification shows why civil justice cannot be reduced to technical problem-solving (Balganesh, 2024, p. 222). Similarly, Bone argues that because courts exist to resolve disputes fairly rather than to implement policy goals, procedural rights, such as

the right to be heard and to challenge evidence, constitute the core of adjudication itself (Bone, 2010, p. 1011). Within this tradition, human oversight and explanation are indispensable because they ensure that litigants can meaningfully influence outcomes and that judicial authority remains publicly accountable.

These commitments are reflected across diverse legal systems. In Europe, Articles 6 of the European Convention on Human Rights and 47 of the EU Charter of Fundamental Rights constitutionalize the right to a fair hearing and to reasoned decisions. Singapore's common-law tradition similarly grounds adjudication in natural justice, with fair-hearing principles remaining binding even in digitalized proceedings (Ling, 2013, p. 1434). China's Civil Procedure Law codifies litigants' participatory rights and requires reasoned judgments, while the Supreme People's Court has reaffirmed that digital tools cannot displace judges' independent evaluation of evidence (Wong, 2025, p. 9). Despite differing institutional contexts, these systems converge on the view that procedural safeguards are the foundation of judicial legitimacy.

At the same time, civil justice faces mounting systemic pressures that make efficiency unavoidable. Growing caseloads, increasing complexity, and limited judicial resources threaten access to justice if procedures become overly slow or costly. In the EU, persistent delays and administrative burdens have driven the adoption of automation and digital case management reforms (Fabri, 2024, p. 2). In China, the nationwide Smart Justice initiative, centered on the Smart Court system deployed across more than 3,000 courts and supported by large-scale AI infrastructure, illustrates how such infrastructure is used to manage massive caseloads and reduce non-judicial burdens (Tang, 2021). Singapore has long prioritized efficiency through comprehensive e-filing and online case management to maintain a lean justice system (Remolina, 2025, p. 8). These examples underscore a shared structural condition rather than a comparative hierarchy.

AI sits at the intersection of these imperatives. While efficiency-oriented tools promise to alleviate backlog and resource constraints, scholarship on automated decision-making warns of procedural risks. Automated systems may undermine participation and transparency, transforming individual errors into systemic ones (Danielle Keats Citron, 2008, p. 1249). Their opacity often prevents meaningful scrutiny by parties or courts (Brauneis & Goodman, 2018, p. 103), and legitimacy depends not only on accuracy but also on the ability to understand and challenge decisions (Krištofik, 2025, p. 2).

Civil justice, therefore, cannot resolve this tension by privileging either rights or efficiency alone. Fairness without functionality renders justice inaccessible, while efficiency without procedural safeguards erodes trust and legitimacy. AI does not dissolve this duality; it magnifies it. Recognizing this structural balance is essential for evaluating how jurisdictions integrate AI into civil justice and for assessing the normative stakes of technological reform.

2.2. Human-centric AI: core procedural safeguards and due process requirements

A rights-first approach to AI in civil justice requires more than abstract commitments to fairness. It demands concrete procedural safeguards capable of preserving the defining features of adjudication in an environment shaped by automation. In this context, human-centric AI refers to systems designed to support, rather than displace, core adjudicative values such as participation, transparency, contestability, judicial accountability, and equality (Pirozzoli, 2024, p. 114). These requirements do not derive from any single regulatory model but from the constitutive logic of adjudication itself. While Section 2.1 explains why civil justice must balance fairness and efficiency, this section identifies the safeguards that become indispensable when fairness is treated as the primary constraint on integrating AI.

The first cluster of safeguards concerns interpretability, contestability, and transparency. Because adjudication depends on publicly accessible reasoning, AI systems that influence judicial determinations must be intelligible to litigants (David Mhlanga, 2023, p. 92). Parties must understand how automated outputs affect fact-finding or legal reasoning; otherwise, courts cannot provide meaningful justification for their decisions. Contestability is equally central. Litigants must be able to challenge automated outputs, identify errors, and present counter-arguments capable of influencing judicial reasoning (Tihomir Katulić, 2023, p. 64). Procedural legitimacy depends not only on correct outcomes but on the ability to question the basis on which those outcomes are produced. Transparency regarding the use, purpose, and limitations of AI tools is therefore essential, as undisclosed automation can shape procedural steps or outcomes in ways that parties cannot detect or contest (Tatiana Dancy & Monika Zalnieriute, 2025, p. 29).

A second cluster addresses human oversight, participation, and proportionality. A rights-first framework requires that human judges retain final decision-making authority and the capacity to critically evaluate AI-generated recommendations (Tumanov, 2025, p. 13). Judicial accountability presupposes independent judgment and cannot be delegated to automated systems. At the same time, AI must not erode parties' opportunities to present arguments, challenge evidence, or participate in hearings, even when automation streamlines procedures (Selçuk *et al.*, 2025, p. 10). To preserve this balance, AI deployment must be proportionate: technological intervention should not weaken procedural rights or exceed what is justified by the complexity or sensitivity of the dispute (Garrett, 2025, p. 933).

The third cluster comprises equality, privacy, and institutional accountability. Because AI systems rely on historical data, they risk reproducing or amplifying existing inequalities (Hanna *et al.*, 2025, pp. 3-4). Human-centric adjudication, therefore, requires ongoing monitoring, auditing, and bias-mitigation mechanisms (Quintanilla, 2018). Privacy protection is equally

integral, as AI tools often involve extensive data processing that can expand surveillance or compromise confidentiality (Hakeemat Ijaiya, 2024, p. 2879). Finally, accountability depends on auditability: courts must be able to trace how AI influenced decisions, identify errors, and assign responsibility (Anna Blackburne-Rigsby *et al.*, 2024).

These three clusters of safeguards form the procedural architecture of human-centric AI in civil justice, providing a common evaluative framework for assessing whether technological integration remains compatible with procedural fairness across jurisdictions.

2.3. Efficiency-driven AI: systemic benefits and procedural risks

Civil justice systems increasingly adopt AI not because of its theoretical promise, but because institutional pressures render automation seemingly unavoidable. Rising caseloads, administrative congestion, judicial staff shortages, and chronic delays threaten access to justice across jurisdictions. In this context, efficiency-driven AI primarily functions as a managerial response: an institutional mechanism designed to accelerate case processing, streamline workflow, and expand system capacity without proportional increases in labor (Victoria Hendrickx, 2025). Its rationale lies in system sustainability rather than the normative enrichment of adjudication. The benefits of efficiency-driven AI can be grouped into three analytical dimensions.

First, AI substantially enhances speed and processing capacity. Automated triage systems allocate cases to procedural tracks within seconds; natural language processing tools extract relevant information from filings; and scheduling algorithms coordinate hearings more efficiently than manual systems. Empirical evidence from platforms such as Canada's Solution Explorer, the UK's Automated Traffic Appeals, and the US Matterhorn ODR system demonstrates significant reductions in early-stage congestion through automation (Cashman & Ginnivan, 2019).

Second, efficiency-oriented AI promotes uniformity and standardization. Pattern-recognition tools cluster cases with similar characteristics, while automated document-generation systems produce standardized orders for routine matters (Mizaras *et al.*, 2025, p. 14). In Brazil, Word2Vec-based models have been used to automate precedent discovery through textual similarity, thereby enhancing both efficiency and consistency in judicial processing (Mentzingen *et al.*, 2024, p. 13).

Third, AI enables resource optimization and scalability. Automated document review, evidence classification, and notification systems reduce clerical burdens, allowing human judges to focus on substantively complex disputes. German courts have employed AI-assisted categorization and draft judgments, while a Colombian pilot reported a fivefold increase in judicial output following AI integration (Nikola L. Datzov, 2025, pp. 25-26).

However, these efficiency gains generate corresponding procedural risks when speed becomes the dominant objective. A first category concerns judicial behavior and decision dynamics. Automation bias may emerge when judges or administrators rely on AI outputs to expedite their workflow (Krištofik, 2025, p. 6). Standardized templates and summaries may also encourage formulaic reasoning, subtly shifting judges from interpretive decision-makers to reviewers of automated suggestions (Antonio Lopo Martinez, 2025, p. 6).

A second category concerns procedural transparency and participation. Workflow opacity occurs when AI is used in tasks such as routing, filtering, or prioritizing cases without informing the parties, leaving them unaware that automation has influenced the progression of their case through the system. Participation may also be compressed: courts adopting streamlined digital procedures frequently reduce oral hearings, rely more heavily on automated document review, or shift toward asynchronous interactions, thereby diminishing litigants' opportunities to directly influence outcomes (Hendrickx, 2025, p. 7). These problems are amplified by digital inequality, as parties with limited internet access, technological literacy, or language support face practical disadvantage in systems designed around digital efficiency.

A third category concerns accountability and institutional integrity. Automation diffuses responsibility across judges, administrators, vendors, and systems, complicating error attribution (MacKenzie, 2025). Moreover, efficiency-oriented systems tend to be brittle: while effective for routine cases, they struggle with atypical or complex disputes, risking error amplification without adequate review (Alessa, 2022, p. 331).

In summary, efficiency-driven AI reveals a structural trade-off: the attributes that enable speed and scalability may also shape decision-making, narrow participation, and obscure responsibility. These vulnerabilities do not negate the value of efficiency, but they underscore the need for deliberate institutional governance and oversight. Understanding how efficiency-based designs reshape civil justice provides the foundation for the comparative analysis that follows, in which the EU, China, and Singapore are shown to adopt distinct strategies for balancing automation with procedural integrity.

3. THREE INSTITUTIONAL LOGICS IN PRACTICE: EU, CHINA, SINGAPORE

3.1. EU: rights-first proceduralism

In the EU, the deployment of artificial intelligence in civil justice is shaped by a rights-first procedural logic grounded in fair-trial guarantees, judicial independence, and contestability, rather than a primary commitment to efficiency maximization (Bamdad Shams, 2025). Although AI is already used in several EU civil justice systems, for example, in case triage, anonymisation, drafting assistance, and limited outcome prediction, its deployment is sys-

tematically constrained by procedural safeguards derived from Article 6 of the European Convention on Human Rights (ECHR), Article 47 of the EU Charter of Fundamental Rights, EU data-protection law, and pan-European judicial ethics frameworks (Deputat, 2025, p. 20). As a result, AI is not treated as a neutral efficiency tool but rather as a technology capable of reshaping judicial procedures and affecting parties' rights (Schmauder *et al.*, 2023, p. 803). The defining feature of the EU approach is therefore not the absence of AI in courts, but the deliberate confinement of AI to supportive functions that do not exercise adjudicative authority or alter procedural power relations between judges and litigants.

Empirical evidence confirms this pattern. According to the CEPEJ Artificial Intelligence Advisory Board's First Annual Report, by the end of 2024 approximately 125 AI and "*cyberjustice*" tools were in use across European judicial systems, the vast majority performing administrative, informational, or drafting-support functions rather than binding decision-making (CEPEJ, 2025, para. 8). These tools include document analysis, anonymisation of judgments, transcription, workflow automation, and legal research assistance. The CEPEJ Ethical Charter explicitly cautions against systems that standardize judicial outcomes through "pure statistical calculation" or interfere with judicial discretion, emphasizing that AI must remain a support instrument rather than a substitute for adjudication (CEPEJ, 2018, p. 5, 15). Procedural legitimacy, rather than performance optimization, thus functions as the primary design constraint for judicial AI in the EU.

This rights-first logic becomes particularly visible under conditions of efficiency pressure. Germany's use of the OLGA system in Dieselgate-related mass litigation illustrates this dynamic. OLGA clusters similar cases, assists with scheduling, and generates draft templates, significantly improving the management of large caseloads (Antonia Hösch *et al.*, 2025). Nevertheless, the system is explicitly designed not to draw binding legal conclusions. Judges retain responsibility for fact-finding, legal qualification, and the adaptation of templates to individual cases, a separation justified as necessary to preserve judicial independence and ensure that judgments remain individually reasoned and contestable (CEPEJ, 2025, para. 46). A similar boundary exists in the Netherlands with the LEXIQ Case Law Engine, which applies machine learning to analyse case-law patterns and generate outcome assessments for use by public authorities. Classified as a decision-support tool, LEXIQ facilitates strategic planning without substituting judicial reasoning or binding decision-making (CEPEJ, 2025, para. 28.3; John Zeleznikow & Fernando Esteban de la Rosa, 2021, p. 62). At the same time, digital and AI-enabled tools may exacerbate information asymmetries where access to or effective use is limited to one party, thereby weakening the procedural position of the other and undermining equality of arms, a core element of the right to a fair trial (Simona Úlehlová, 2025, p. 547).

The EU's procedural boundaries are most explicit where AI threatens to reconfigure adjudicative power relations. France's legislative prohibition on judicial analytics tools that predict or rank individual judges' behavior ex-

emphasizes this limit (Cesta, 2024, p. 72). The prohibition rests not on doubts about accuracy. However, there are concerns that predictive tools could undermine judicial independence, facilitate forum shopping, and erode equality of arms (CEPEJ, 2018, para. 46). This episode functions as a paradigmatic boundary case: AI is rejected not because it fails to deliver efficiency, but because it alters the procedural architecture through which judicial authority is exercised and contested.

Experiments that move closer to decisional automation are therefore tightly circumscribed. In Estonia, AI may issue initial decisions in tiny civil claims (up to EUR 7,000), provided that such decisions are subject to full human judicial review and can be replaced on appeal (Tara Vasdani, 2019). Academic commentary has noted that such experiments raise fair-trial concerns where automated outcomes are insufficiently reasoned or difficult for parties to understand and challenge (Andrea Maria Garofalo, 2023, p. 77). Accordingly, automation is considered compatible with EU fundamental rights only where effective human review and correction are guaranteed (Tommaso De Mari Casareto dal Verme, 2023, p. 146).

Within this institutional context, the EU Artificial Intelligence Act plays a reinforcing rather than constitutive role. By classifying AI systems used in the administration of justice as high-risk, the Act embeds requirements of human oversight, transparency, robustness, and risk management into system design, effectively consolidating existing reluctance to delegate decisional authority to algorithms (JURI, 2025). At the same time, the EU's rights-first proceduralism is not without institutional costs. By prioritizing ex ante safeguards and strict limits on decisional automation, EU civil justice systems constrain the speed, scale, and scope of AI deployment, particularly in jurisdictions facing chronic backlogs and resource constraints (CEPEJ, 2025, para. 50). Moreover, safeguards implemented through formal compliance mechanisms, such as documentation, auditability, and human-in-the-loop requirements, risk becoming symbolic where institutional capacity or user understanding is limited (Dinesh Deckker & Subhashini Sumanasekara, 2025, pp. 249, 255). The EU model thus reveals a structural paradox: procedural protections designed to secure fairness may, under systemic strain, also limit timely access to justice.

3.2. China: efficiency-first judicial modernisation

In China, the integration of artificial intelligence into civil justice reflects an efficiency-first model of judicial modernization that is institutionally deliberate rather than technologically incidental (Chen & Li, 2020, p. 57). Judicial AI is introduced as part of a top-down reform strategy to help courts handle large caseloads and maintain consistent practices within a centrally organized judicial system. This logic is articulated most clearly in the Supreme People's Court's Smart Court reform agenda. The *Opinions on Accelerating*

the Construction of Smart Courts define smart courts as a comprehensive institutional framework in which judicial activities are handled online, procedural stages are integrated across platforms, and intelligent services support adjudication and enforcement throughout the process (SPC, 2017, para. I(1)). The document explicitly links informatization and artificial intelligence to improvements in adjudicative efficiency, administrative coordination, and workload management. AI is framed as part of judicial infrastructure, supporting filing, trial management, judgment drafting, and enforcement, rather than as a discretionary or experimental tool (Tahura & Selvadurai, 2023).

The efficiency-first orientation is further operationalized through the establishment of Internet Courts and nationwide online litigation platforms. According to the White Paper on the Application of Internet Technology in Judicial Practice, Internet Courts were established to address the rapid growth of online disputes, particularly in areas such as e-commerce, online services, and digital contracts, by channeling them into standardized, platform-based procedures (SPC, 2019, pp. 12-15). These courts rely on full-process online litigation, encompassing filing, evidence exchange, hearings, judgment issuance, and enforcement. Central to this model is case classification and diversion, in which intelligent systems distinguish high-frequency, low-value disputes from more complex cases and channel them to Internet Courts in Hangzhou, Beijing, and Guangzhou, enabling strategic, scalable allocation of judicial resources (Shi *et al.*, 2021, p. 11). These mechanisms enable courts to process substantially larger volumes of routine cases through online channels, contributing to shorter average processing times and reduced administrative burdens for judges. For example, the Beijing Internet Court has reported using AI-assisted tools to process copyright disputes in bulk, resulting in a 40% reduction in average case processing time (Zeng Chenyi *et al.*, 2025, p. 76).

Efficiency-oriented digitalization has also been consolidated through the Rules of Online Litigation of People's Courts, which extend online procedures across civil, administrative, special procedure, and enforcement cases (SPC, 2021). By institutionalizing online handling as a default procedural pathway rather than an exception, the Rules embed efficiency, convenience, and scalability into the legal framework governing civil adjudication. Judicial AI operates at scale through centralized data infrastructures. Nationwide platforms, such as China Judgments Online and inter-court data networks, enable courts to manage rapidly expanding civil caseloads while maintaining standardization and coordination across jurisdictions (Z. Wang, 2021). These infrastructures support real-time data aggregation and monitoring, allowing higher judicial authorities to observe procedural patterns and adjudicative outputs across courts. In 2024, the Supreme People's Court launched a national legal AI platform built on hundreds of millions of judicial records, designed to assist judges in extracting key issues, generating outlines, and reviewing materials more efficiently (SPC, 2024).

Official descriptions emphasize that the platform is intended to accelerate routine judicial tasks, such as issue identification and document review,

across courts nationwide, thereby increasing throughput in standard cases without proportional increases in judicial staffing. Its reliance on centralized, authoritative datasets highlights how China's institutional structure enables the rapid, coordinated deployment of AI technologies without the fragmentation risks associated with decentralized experimentation.

At the same time, efficiency-first judicial modernization entails institutional trade-offs that merit careful acknowledgment. While human judges formally make the final decisions, AI systems increasingly shape the information presented to judges and the way cases are processed prior to adjudication (Tahura & Selvadurai, 2023, p. 15). Through mechanisms such as algorithmic case profiling and template-based drafting, these systems standardize the categorization, prioritization, and resolution of disputes, thereby narrowing the range of procedural and substantive discretion exercised in routine cases.

Some scholars characterize this mode of automation as creating a form of “*digital iron cage*” (*shuju tielong*), in which procedural standardization is closely aligned with broader governance objectives of the party-state, giving rise to conditions of heightened supervisory or “*panoptic*” control (Papagiannas & Junius, 2023, pp. 6, 11). Within this framework, judges may increasingly function as implementers of pre-structured digital workflows rather than as autonomous adjudicators, particularly in high-volume, low-value disputes. Efficiency-oriented design thus tends to deprioritize individualized reasoning, procedural contestation, and transparency regarding algorithmic influence. These effects do not negate the model's rationality, but they underscore the institutional costs associated with large-scale automation.

3.3. Singapore: pragmatic hybrid governance in civil justice innovation

Singapore's integration of artificial intelligence into civil justice reflects a pragmatic hybrid governance strategy that is governance-first and human-centric (Nydia Remolina, 2025, p. 5). AI is deliberately deployed to augment, rather than replace, human judgment, and is embedded within existing procedural, ethical, and professional frameworks rather than used to automate adjudicative functions. At the regulatory level, Singapore has adopted a deliberate “*wait-and-see*” approach, often described as “*masterly inactivity*”, that defers binding AI-specific legislation in favor of soft-law guidance and institutional learning (Pang Cheng Kit Kit, 2025, pp. 224-225). This combination of assistive technology use and regulatory restraint enables efficiency gains while mitigating the risks that premature automation or rigid regulation could undermine judicial discretion, procedural fairness, and public trust in the courts.

This orientation is most clearly articulated in the Supreme Court of Singapore's Guide on the Use of Generative Artificial Intelligence Tools by Court Users, issued through Registrar's Circular No. 1 of 2024 and parallel circulars

for the State Courts and Family Justice Courts. The Guide explicitly frames generative AI as a support tool whose outputs remain the responsibility of the human user. Court users are required to verify the accuracy of their submissions, avoid fabrication, and be prepared to disclose their use of AI when directed, underscoring the continued centrality of human judgment and accountability in judicial processes (Supreme Court of Singapore, 2024, para. 5(1)). In this framework, “*human-in-the-loop*” oversight operates not merely as a formal safeguard, but as a practical constraint on how AI may be used: AI can assist with drafting, research, and information organization, but it cannot substitute for legal judgment or determine procedural or substantive outcomes (Enarsson *et al.*, 2022, p. 133).

This cautious, governance-first approach is reinforced by sector-wide guidance issued by the Ministry of Law. The Guide for Using Generative AI in the Legal Sector emphasizes the importance of diagnosing institutional needs, assessing risks, training users, and continuously reviewing AI deployment (Singapore Ministry of Law, 2025). AI adoption is thus treated as an ongoing governance process rather than a one-time technological upgrade, reflecting a preference for incremental integration and institutional learning over rapid or comprehensive automation.

At the institutional level, Singapore’s courts have prioritized digital infrastructure that improves workflow efficiency while explicitly preserving conventional adjudicative roles. This approach is reflected in the use of a range of assistive AI tools, including Harvey AI for multilingual document translation, case summarisation, and document analysis; a neural-network-based Speech Translation System for real-time transcription of hearings; Pair Search, developed by the Government Technology Agency, to support research across legislation, judgments, and parliamentary materials; AI-enhanced features in LawNet and the GPT-Legal Q&A tool for legal research; Microsoft Copilot for administrative tasks; and controlled drafting and “*red-teaming*” experiments (Oxford, 2025). These tools streamline procedural administration and reduce transaction costs. However, they are deliberately designed as workflow supports rather than decision-making systems, ensuring that judicial discretion over case management, evidence assessment, and legal reasoning remains intact (Lim Chong Kin *et al.*, 2025).

Judicial innovation in Singapore is pursued through a phased and strategic approach under the Technology & Innovation Roadmap (TIR), which sets out a sector-wide plan for legal and judicial technology development through 2030. Rather than relying on ad hoc experimentation, new technologies, such as E-Courts, expanded video conferencing for hearings, and advanced digital presentation tools, including virtual reality-based witness visualization, progressively integrate into the civil justice system. This process is accompanied by regular reviews of the regulatory and legislative framework conducted by the Ministry of Law to ensure that it remains sufficiently flexible to accommodate technological change (MinLaw, 2020, p. 30). Supported by governance instruments such as the Model AI Governance Framework, this structured

methodology enables courts and legal institutions to test and adopt new tools responsibly while maintaining transparency, enhancing access to justice, and safeguarding the interests of court users.

At the policy level, Singapore's National AI Strategy 2.0 situates judicial AI within a broader vision of a "*trusted ecosystem*" for AI deployment (Jason Grant Allen & Jane Loo, 2025, p. 158). The Strategy emphasizes explainability, risk-based oversight, and sector-specific governance mechanisms, highlighting the importance of maintaining public confidence in AI-enabled systems (Singapore Ministry of Law, 2025). Within the justice sector, these principles are operationalized through an explicit reluctance to delegate normative or discretionary functions to AI, even where efficiency gains might be achievable. AI is framed as a means of supporting access to justice and administrative effectiveness, not as a substitute for human adjudication.

4. COMPARATIVE EVALUATION: MAPPING THE HUMAN-CENTRIC AND EFFICIENCY SPECTRUM

4.1. Comparing procedural value priorities and regulatory orientations

This subsection compares the EU, China, and Singapore at the most fundamental comparative level: what each system prioritizes when AI is introduced into the adjudication process. Rather than examining specific technologies or procedural mechanisms, the analysis focuses on the dominant procedural value that anchors regulatory orientation in each system, as reflected in existing legal frameworks, policy documents, and scholarly assessments discussed earlier.

In the EU, the central priority is the protection of litigants' procedural rights and adjudicative integrity. Core principles such as the right to be heard, equality of arms, judicial independence, and reasoned decision-making function as baseline constraints on the permissible use of AI in judicial processes. As reflected in the EU's rights-based regulatory discourse and fundamental rights-oriented AI governance framework, AI is approached with caution and framed primarily as a potential source of procedural risk rather than as a neutral efficiency-enhancing tool (Selçuk *et al.*, 2025, p. 5). The regulatory emphasis, therefore, lies in preserving the procedural relationship between judges and parties, even where this limits the scope of automation or slows technological uptake.

China adopts a contrasting value orientation, in which system capacity, consistency, and administrative coordination are treated as paramount. Judicial AI is embedded within a broader court modernization agenda led by the Supreme People's Court, which emphasizes standardization, caseload management, and the use of technology to enhance the overall functioning of the judicial system (N. Wang & Tian, 2023, p. 350). Procedural rights and human

adjudication remain formally acknowledged, but they are situated within a governance model that prioritizes maintaining system stability and throughput across a large, centralized court structure. The guiding regulatory question, therefore, is how AI can enhance system-wide performance, rather than how it might alter individual procedural interactions.

Singapore occupies an intermediate position, characterized by a priority on maintaining institutional trust through responsible human control. Scholarly analysis highlights Singapore's light-touch regulatory approach, which relies on voluntary frameworks and existing statutory controls rather than AI-specific procedural codes (Tristan Toh, 2025). Within this model, AI is framed as assistive and conditional, acceptable so long as judges and legal professionals remain accountable for outcomes (Jason Grant Allen & Jane Loo, 2025, pp. 1-2). The regulatory emphasis is not on elevating either procedural rights or efficiency as absolute constraints, but on preserving confidence in judicial decision-making through professional responsibility and incremental governance.

Comparatively, these value priorities establish three distinct starting points for AI governance in civil justice: rights-anchored legitimacy in the EU, system-anchored capacity in China, and trust-anchored responsibility in Singapore. These orientations do not yet determine how safeguards are implemented or how efficiency is realized. However, they shape the regulatory logic that informs those subsequent choices, providing the baseline for the analyses in Sections 4.2 and 4.3.

4.2. Comparing procedural safeguards and risk mitigation

Building on Section 4.1, this subsection compares how procedural risks created by AI-assisted adjudication are managed in practice across the EU, China, and Singapore. Rather than revisiting underlying value priorities, the analysis focuses on three recurring risk points—excessive deference to automated outputs, reduced opportunities for party participation, and accountability gaps—and examines the institutional channels through which these risks are addressed. The comparison concentrates on human oversight, transparency, contestability, and mechanisms for error correction.

Human oversight is preserved in all three systems, but it is exercised through distinct governance channels. In the EU, oversight is structured around requirements for meaningful human review of AI-assisted outputs and limits on automation where it could displace judicial assessment (Corrêa *et al.*, 2025). Judges are expected to evaluate AI-generated recommendations rather than rely on them mechanically. In practice, however, the effectiveness of this safeguard is uneven. Time pressure and disparities in technical expertise can limit the depth of scrutiny judges apply to AI-supported materials, thereby weakening oversight in routine or high-volume cases (Fine *et al.*, 2025, p. 491). In China, human oversight operates primarily through admin-

istrative hierarchies rather than case-by-case judicial reassessment. Judges remain formally responsible for outcomes, but AI systems structure case processing and drafting in standardized ways. Safeguards, therefore, function mainly through system design and centralized supervision, rather than through individualized judicial intervention (Ji, 2020, pp. 519, 526; Papagiannas & Junius, 2023, p. 6). Singapore adopts a governance-based approach in which human control is maintained through professional responsibility and user accountability, rather than through detailed AI-specific procedural mandates (Lim Chong Kin *et al.*, 2025).

Transparency and contestability highlight a sharper divergence in how risks to party participation are addressed. In the EU, transparency is treated as a procedural requirement: parties should be able to understand how AI influences proceedings and to challenge its use where appropriate (Shams, 2025). This strengthens equality of arms but increases procedural complexity and compliance burdens. In China, AI often operates within internal judicial workflows that are neither fully transparent nor easily challengeable by litigants, thereby limiting the effective contestation of algorithmic influence on procedural outcomes (Ji, 2020, p. 526). Singapore occupies an intermediate position in terms of contestability. While AI use is disclosed and framed as assistive, parties do not enjoy explicit procedural rights to contest its influence; instead, challenges depend on judicial discretion and the professional responsibilities of legal actors within existing legal frameworks (Tristan Toh, 2025).

Accountability and error correction further differentiate the systems. The EU emphasizes traceability and legal responsibility, seeking to ensure that AI-related errors can be identified and remedied through established legal channels, although this depends on litigants' capacity to activate available remedies (Socol De La Osa & Remolina, 2024, pp. 7, 24, 26). China prioritizes system stability and correction through administrative supervision rather than litigant-initiated procedural challenges, enabling rapid internal adjustment at scale while narrowing opportunities for individual review (Peng & Xiang, 2019, pp. 358, 365). Singapore places responsibility squarely on human users rather than AI systems, ensuring clear accountability (Jason Grant Allen & Jane Loo, 2025, p. 16). However, this approach remains vulnerable to failures of professional compliance or institutional oversight.

4.3. Comparing systemic efficiency and innovation capacity

This subsection compares the effectiveness of each system in utilizing AI to enhance systemic efficiency and sustain institutional innovation capacity in civil justice over time. Efficiency refers to throughput, consistency, and cost control at scale (Ashish Prasad *et al.*, 2024). In contrast, innovation capacity concerns the ability to experiment, adapt, and upgrade AI tools without disrupting institutional stability or coordination (Arbel, 2025, p. 581).

China demonstrates the highest level of system-wide efficiency and a strong capacity for centralized innovation. AI is deeply embedded in judicial workflows, enabling courts to process enormous caseloads with speed and consistency. This approach is reinforced by policy mandates requiring courts to develop advanced AI systems by 2025 to support judicial operations and legal services (SPC, 2022). Over time, this model generates rapid diffusion and coordinated upgrading across jurisdictions. The trade-off is reduced adaptability at the individual court level: efficiency gains rely on standardized processes applied across courts, limiting opportunities for localized experimentation and case-specific adjustments (Ji, 2020, p. 521). Innovation, therefore, follows a centralized, top-down trajectory, prioritizing scalability over decentralized learning.

The EU exhibits a more constrained efficiency profile and fragmented innovation capacity. AI adoption proceeds cautiously and unevenly, often concentrated in administrative support and case management functions (JURI, 2025, p. 25). While this slows system-wide efficiency gains, it allows experimentation to remain localized within national or institutional boundaries. Innovation thus advances incrementally, shaped by jurisdictional diversity and compliance requirements that raise coordination costs (Bertolini, 2025, p. 9). Over time, this produces a pattern of responsible piloting but limited translation of successful initiatives into uniform efficiency improvements across courts.

Singapore occupies an intermediate position characterized by selective efficiency gains and staged innovation (Shaun Lim, 2021, pp. 281, 288). AI is deployed in targeted domains to streamline workflow and reduce delay, particularly in standardized procedural contexts. Innovation is pursued through pilots and feedback-driven adjustment, enabling learning without large-scale disruption. However, efficiency gains remain bounded by system size and institutional resources, and innovation advances in carefully sequenced steps rather than through rapid expansion. This produces a stable but relatively low-ceiling trajectory of innovation.

Compared with one another, the three systems display distinct institutional trajectories. China emphasizes scale and speed through centralized rollout; the EU advances through cautious, fragmented experimentation; and Singapore balances selective efficiency with controlled learning. These differences reflect path-dependent governance choices that shape the evolution of efficiency and innovation, rather than differences in technical capacity alone.

5. BROADER INSIGHTS FOR AI-ENABLED CIVIL JUSTICE REFORM

This section distills broader insights from the comparative framework developed in Section 4. Rather than restating jurisdictional descriptions or advancing a universal reform model, it uses the spectrum to clarify why di-

vergence persists, which procedural safeguards emerge comparatively, and how reform pathways can be calibrated to institutional capacity.

The analysis shows that divergent approaches to AI-assisted civil justice in the EU, China, and Singapore are neither transitional nor accidental. They reflect structurally embedded differences in legal culture, institutional capacity, and the political economy of judicial governance. These differences shape not only how AI is deployed, but also which procedural risks are considered acceptable and which are treated as system-threatening. As a result, convergence toward a single AI governance model would require not merely regulatory alignment, but structural reconfiguration of judicial roles and governance arrangements—an option that most systems are institutionally unwilling or unable to pursue. Accordingly, the comparison suggests that differences across systems reflect incompatible institutional logics rather than temporary regulatory gaps, underscoring the need to reject one-size-fits-all reform approaches.

Within these constraints, it nonetheless allows the identification of a limited set of procedural safeguards that recur across systems. These safeguards do not emerge from abstract normative catalogs, but from recurring patterns of procedural trade-offs observable across different institutional approaches.

First, baseline transparency of AI involvement emerges as a functional requirement. While the EU treats transparency as a procedural entitlement, Singapore approaches it through disclosure embedded in professional governance, and China largely confines it to internal administrative processes. Despite these differences, the absence of visibility consistently weakens oversight and accountability, regardless of governance model.

Second, graduated contestability appears as a recurring procedural safeguard across different governance models. Contestation is strongest in rights-oriented systems, moderated through discretion and professional responsibility in intermediate systems, and limited in efficiency-driven systems. The comparative insight is not that full contestability must exist everywhere, but that some channel for challenging AI influence is necessary to prevent unchecked automation.

Third, proportional deployment of automation recurs across systems. Across systems, AI is more deeply embedded in standardized, low-discretion tasks and more constrained in high-stakes or complex adjudication. This proportionality is not imposed uniformly, but it reflects a shared sensitivity to the relationship between automation intensity and procedural risk.

The comparison also highlights how AI reform must be adapted to differing institutional capacities and procedural priorities. Systems positioned toward the human-centric end face the challenge of adopting AI technologies without undermining procedural legitimacy; therefore, reform pathways emphasize incremental adoption, domain restriction, and reinforcement of human oversight. Absent such calibration, AI integration risks either symbolic adoption or procedural backlash that undermines trust in the adjudication

process. Systems positioned toward the efficiency-driven end confront the opposite challenge of sustaining legitimacy as AI becomes structurally embedded; here, reform pathways focus on enhancing transparency, clarifying responsibility, and introducing limited channels of contestation that do not compromise throughput. Without such adjustments, efficiency gains risk accumulating legitimacy deficits over time. Intermediate systems benefit from flexibility but face ceiling effects, as reliance on professional responsibility and discretion becomes increasingly fragile under the pressures of scale and complexity.

These insights reinforce that AI-enabled civil justice reform does not eliminate procedural risk but redistributes it across participation, accountability, and efficiency. The comparative developed in this study functions not as a blueprint for reform, but as a diagnostic tool for identifying institutional constraints and acceptable risk trade-offs. It thus serves not to prescribe convergence, but to discipline reform debates by clarifying what different systems can realistically achieve—and what risks they must consciously accept.

6. CONCLUSION

This study examined how different institutional contexts shape the integration of artificial intelligence into civil justice across the EU, China, and Singapore. The findings show that AI-enabled adjudication is best understood as an institutional design problem rather than merely a question of technological adoption or regulatory readiness. How AI reshapes adjudication depends fundamentally on legal culture, governance structures, and capacity constraints, which determine what forms of automation are procedurally acceptable and practically feasible.

Three distinct approaches to AI-enabled civil justice emerge from the comparison. The EU adopts a rights-first model that constrains automation through procedural safeguards and judicial oversight. China integrates AI into a broader, efficiency-oriented strategy of judicial modernization, centered on scalability, coordination, and standardized adjudication. Singapore occupies an intermediate position, pursuing incremental and governance-based AI integration while maintaining human accountability and professional responsibility. These approaches demonstrate that AI governance in civil justice does not converge toward a single model, but instead reflects divergent procedural priorities and governance structures.

Furthermore, safeguards such as transparency, contestability, and human oversight cannot be evaluated independently from the environments in which they operate. In rights-oriented systems, these safeguards serve as formal procedural guarantees that can constrain the use of automation. In efficiency-oriented systems, they are more limited and often subordinated to coordination and throughput. Intermediate models rely more heavily on professional responsibility and discretionary governance. Similar safeguards

may therefore produce different practical effects depending on procedural design, administrative capacity, and institutional context.

Several practical considerations follow from this comparison. *First*, AI deployment should remain proportionate to the procedural sensitivity of the judicial function involved, with stronger human oversight preserved in adjudicative processes directly affecting procedural rights, evidentiary evaluation, or judicial discretion. *Second*, safeguards such as transparency and contestability should be adapted to institutional conditions rather than transplanted uniformly across jurisdictions. *Third*, systems pursuing efficiency-oriented judicial digitalization should incorporate mechanisms that preserve accountability and meaningful opportunities for procedural challenge as automation becomes more deeply embedded in court operations.

The comparison reveals that significant limitations remain across existing approaches. Rights-oriented systems may struggle to expand automation without increasing administrative burdens and implementation delays that may ultimately undermine access to justice. Efficiency-oriented models achieve greater scalability but risk weakening transparency, individualized reasoning, and meaningful contestation as automation deepens. Intermediate approaches offer flexibility, yet their reliance on professional responsibility and discretionary oversight may become increasingly fragile as technological scale expands. These tensions suggest that no existing model fully resolves the structural trade-offs between efficiency, accountability, and procedural legitimacy in AI-assisted adjudication. Future research could therefore examine how rights-oriented systems can expand automation without undermining access to justice, whether efficiency-oriented models can incorporate stronger contestability mechanisms without sacrificing scalability, and whether intermediate governance approaches remain viable as generative AI becomes more deeply embedded in judicial workflows.

Ultimately, the comparison demonstrates that AI integration in civil justice inevitably reshapes the balance between participation, oversight, and efficiency within adjudication. These risks cannot be eliminated solely through technological refinement, but must instead be managed in ways consistent with institutional capacity, procedural expectations, and broader governance objectives. AI-enabled civil justice reform should therefore be approached in a diagnostic rather than purely prescriptive manner, recognizing that different systems have distinct procedural traditions, governance structures, and tolerance for automation-related risks. Reform efforts that ignore these structural differences are likely to reproduce familiar tensions without addressing their underlying causes. By clarifying these trade-offs and institutional constraints, this study contributes to a more realistic and comparatively grounded understanding of how civil justice systems can adapt to accelerating technological change while preserving procedural legitimacy and public confidence in adjudication.

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