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THE PROSPECTS OF SPECIAL REGULATION FOR ONLINE DISPUTE RESOLUTION (ODR) TO PROTECT ONLINE CONSUMER IN INDONESIA

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Abstrak

Indonesia merupakan pasar e-commerce terbesar di Asia Tenggara dengan 229,4 juta pengguna internet dan nilai transaksi digital mencapai Rp487 triliun per tahun. Melonjaknya sengketa konsumen digital yang bersifat rendah nilai, volume tinggi, dan lintas yurisdiksi menunjukkan ketidakcocokan mendasar dengan mekanisme penyelesaian sengketa konvensional seperti BPSK dan gugatan sederhana, yang semakin diperparah oleh pemangkasan anggaran BPKN sebesar 73% menjadi Rp2,38 miliar pada tahun 2025. Penelitian ini bertujuan menganalisis urgensi dan arsitektur ideal regulasi Penyelesaian Sengketa Daring (ODR) yang bersifat lex specialis dalam sistem hukum Indonesia, melalui studi komparatif dengan model Uni Eropa dan standar internasional UNCITRAL. Metode yang digunakan adalah hukum normatif-doktrinal dengan pendekatan perundang-undangan, konseptual, dan komparatif. Hasil penelitian menunjukkan kegagalan paradigmatik kerangka hukum positif yang dirancang untuk sengketa fisik-lokal, serta perlunya adopsi selektif model Uni Eropa dengan modifikasi sifat mandatory compliance yang terintegrasi dengan infrastruktur identitas digital nasional.

Kata kunci : Penyelesaian Sengketa Daring; Perlindungan Konsumen Digital; Lex Specialis; Perdagangan Elektronik; Uni Eropa.

Abstract

Indonesia is the largest e-commerce market in Southeast Asia with 229.4 million internet users and digital transaction values reaching IDR 487 trillion per year. The surge in digital consumer disputes characterized by low value, high volume, and cross-jurisdictional nature reveals a fundamental mismatch with conventional dispute resolution mechanisms such as BPSK and small claims courts, further compounded by a 73% budget cut to the BPKN in 2025. This research analyzes the urgency and ideal architecture of a lex specialis Online Dispute Resolution (ODR) regulation within Indonesia's legal system, through a comparative study with the European Union model and UNCITRAL international standards. A normative-doctrinal legal method is employed with legislative, conceptual, and comparative approaches. Results demonstrate a paradigmatic failure of existing legal frameworks designed for physical-local disputes and the necessity of selectively adopting the EU model with mandatory compliance modifications integrated with national digital identity infrastructure.

Keywords : *Online Dispute Resolution; Online Consumer Protection; Lex Specialis; E-Commerce; European Union.*

I. INTRODUCTION

The digital transformation of the 21st-century economy has made Indonesia the country with the largest e-commerce market in Southeast Asia, with 229.4 million internet users and digital transaction values reaching Rp487 trillion per year.[1] In this ecosystem, digital consumer disputes have characteristics that are fundamentally different from conventional disputes: they are low-value, high-volume, cross-jurisdictional, and entirely based on digital information. When a consumer in Jakarta disputes with a seller in Medan over an item worth Rp100,000, the logic of the conventional judicial system and dispute resolution institutions becomes truly disproportionate.[2]

Empirical facts confirm this institutional dysfunction. In the first semester of 2022, the e-commerce sector contributed 86.1% of all consumer complaints received by the Directorate General of Consumer Protection and Trade Compliance (Ditjen PKTN). However, instead of providing adaptive solutions, the budget for the National Consumer Protection Agency (BPKN) was cut by 73% in 2025 from Rp8.96 billion to only Rp2.38 billion a blow that effectively cripples the institutional capacity to modernize the digital dispute resolution process. The Consumer Dispute Settlement Agency (BPSK), which relies on manual mechanisms, physical presence, and analog bureaucracy, is unable to deliver justice that is 'Simple, Fast, and Low-Cost' as mandated by Article 2 paragraph (4) of Law Number 48 of 2009 on Judicial Power.[3]

In analyzing this structural crisis, four theoretical frameworks become the determining analytical tools. Richard Susskind argues that technology has transformed the courtroom from a place into a service, with the vision that justice should be as accessible as a digital transaction itself.[4] Ethan Katsh and Janet Rifkin go further by introducing the concept of technology as the fourth party not just a passive medium, but an active digital actor that orchestrates the flow of information, automates case analysis, and even proposes resolutions thru algorithms.[5]

Lawrence Lessig, with his theory Code is Law, reveals a more fundamental paradox: the private architecture of marketplace platforms (West Coast Code) has factually outperformed state law (East Coast Code) in dictating digital consumer rights.[6] Roger Brownsword, thru the Law 3.0 paradigm, asserts that in this era, technology governance is no longer merely a complement to normative compliance but rather its substitute. Countries that fail to integrate regulation into the technical architecture will lose digital sovereignty over their citizens.[7]

At the normative level, Indonesia faces a condition that can be described as a paradoxical legal vacuum. On one hand, the UNCITRAL Technical Notes on ODR

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[1] Hanida, Dian. "Penerapan Online Dispute Resolution (ODR) dalam Upaya Penyelesaian Sengketa E-Commerce di Indonesia." *YUSTISI*, 2023. page. 31.
[2] Kenza Radhya E. A."Online Dispute Resolution Sebagai Alternatif Penyelesaian Sengketa Fintech Di Era Industri 4.0," *Jurnal Kewarganegaraan* (2023), Page 2056.
[3] Antara News, "Anggaran BPKN Dipangkas Sekitar 73 Persen Akibat Efisiensi Belanja," 13 February 2025; JPNN.com, "Anggaran BPKN Sisa Rp 2,3 M setelah Kena Efisiensi 73 Persen," 13 February 2025.
[4] Richard Susskind, Online Courts and the Future of Justice Oxford: *Oxford University Press*, 2019, Page. 66.
[5] Ethan Katsh dan Janet Rifkin, Online Dispute Resolution: Resolving Disputes in Cyberspace. San Francisco: *Jossey-Bass*, 2001, Page. 15.
[6] Lawrence Lessig, Code and Other Laws of Cyberspace New York: *Basic Books*, 1999, Page. 4.
[7] Roger Brownsword, Law 3.0: Rules, Regulation, and Technology Abingdon: *Routledge*, 2020, Page 15.

(2016) have established global standards based on four pillars of digital trust: fairness, transparency, impartiality, and accountability. On the other hand, the existing Indonesian legal framework is fragmented and pre-digital: Law No. 30/1999 on Arbitration requires physical documents; Law No. 11/2008 on ITE only recognizes technological neutrality without minimum procedural standards for ODR; while sectoral regulations such as Perma No. 3/2022 only cover mediation that is already connected to litigation cases, not standalone non-litigation mechanisms.[8]

This legal vacuum raises two fundamental questions that are the core of this research: First, why is the creation of special regulations for ODR is necessary within the online consumer dispute resolution system in Indonesia? Second, how might policy lessons from the European Union's model inform the potential for and the optimal structure of specific ODR regulation in Indonesia?

II. RESEARCH METHOD

This research uses the doctrinal legal method, focusing on the analysis of das sollen versus das sein of the applicable written law (law on the books) in the context of resolving digital consumer disputes. Three approaches are integratively combined: First, the Statute Approach toward the ITE Law, Consumer Protection Law No. 8/1999, Arbitration Law No. 30/1999, and Supreme Court Regulation No. 4/2019 on Simple Lawsuits. Second, the Conceptual Approach toward the theoretical framework of Law 3.0 Brownsword, the Fourth Party concept by Katsh-Rifkin, and Susskind's Transformative Justice. Third, the Comparative Approach toward Regulation (EU) No 524/2013, Directive 2013/11/EU on consumer ADR, and eIDAS Regulation No 910/2014.

The data used are secondary data consisting of primary legal materials (legislation and court decisions), secondary legal materials (academic literature, legal journals, and expert comments from Susskind, Lessig, Brownsword, Katsh, Shidarta, and Morek), as well as tertiary legal materials (legal dictionaries and encyclopedias). The entire data set is analyzed qualitatively-prescriptively (Prescriptive Analytical Research) to formulate recommendations for an ideal ODR regulatory architecture for the Indonesian context.

III. RESULTS AND DISCUSSION

A. The Urgency of Special Regulations for Online Dispute Resolution in the Indonesian Consumer Protection Legal System

1. Incompatibility of the Principles of Positive Civil Procedure Law with Electronic Disputes

The Indonesian civil procedural law system (HIR/RBG) and the Consumer Protection Law No. 8/1999 have experienced a paradigmatic failure (structural malfunction) in handling e-commerce disputes. This failure is not merely a

[8] Aziz, Muhammad Faiz dan Muhammad Arif Hidayah. "Perlunya Pengaturan Khusus Online Dispute Resolution (ODR) di Indonesia untuk Fasilitasi Penyelesaian Sengketa E-Commerce." *RECHTS VINDING,* 2020. Page. 275.

technical administrative issue, but rather a fundamental flaw in institutional design: the system was designed for the physical-local world, while digital disputes are borderless and asynchronous.[9]

Article 118 paragraph (1) of the HIR, which adheres to the principle of *actor sequitur forum rei* consumers must file a lawsuit in the court or BPSK of the defendant's domicile becomes an absurd jurisdictional barrier in the digital context. A consumer in Jakarta who is harmed by Rp100,000 by a seller in Medan is legally required to file a lawsuit physically in Medan. The costs of transportation, accommodation, and lost work time exponentially exceed the value of the loss. This condition gives rise to a phenomenon identified by Shidarta as Rational Apathy: consumers choose to forgo their losses because the cost of legal proceedings, in rational-economic terms, far exceeds the value of the loss itself.[10] As a result, the legal system indirectly provides immunity to unscrupulous business operators to accumulate small-scale violations without the threat of effective legal consequences.[11]

2. The Problem of the Validity of Digital Evidence and the Dominance of Private Platform Governance

Although Article 5 paragraph (1) of the ITE Law recognizes electronic information and documents as valid legal evidence, its implementation in non-litigation consumer disputes creates what can be called a digital proof paradox. In the manual practice of BPSK, consumers are often forced to print digital evidence screenshots of conversations, unboxing videos, transaction logs into physical documents. There are no mass-scale digital forensic protocols, no centralized dashboard that allows both parties to access and respond to evidence transparently, and no minimum standards for the validity of asynchronous digital evidence.[12]

The regulatory vacuum left by state law is then factually filled by internal marketplace mechanisms such as the Resolution Center. This mechanism is opaque, unilateral, not publicly accountable, and prioritizes corporate business efficiency over consumer procedural justice. In Lessig's framework, this is the dominance of the West Coast Code over the East Coast Code when the private architecture of platforms overrides state law in determining the fate of digital consumers.[13]

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[9] Ilham Bagaskara Aji dan Pujiyono, "Problematika Hukum Arbitrase Online Menurut UU No. 30 Tahun 1999 tentang Arbitrase dan Alternatif Penyelesaian Sengketa," *Jurnal Privat Law,* 2020, Page. 341.

[10] Shidarta, "Hukum Perlindungan Konsumen" Indonesia Jakarta: *Grasindo*, 2000, Page. 15.

[11] Prabowo, Muchammad Shidqon dan Dewi Sulistianingsih.. "The Powerlessness of BPSK in Digital Consumer Protection." *Journal of Consumer Law and Policy*, 2023, Page. 14.

[12] Purwoko, A. Joko. "Optimalisasi Badan Penyelesaian Sengketa Konsumen (BPSK) sebagai Lembaga Penyelesaian Sengketa Konsumen di Luar Pengadilan." *Unisbank Semarang*, 2016. Page. 414.

[13] Dwinanda, Sahlevi. "Perbandingan Efektivitas Penyelesaian Sengketa Konsumen pada Pengadilan Negeri dan Badan Penyelesaian Sengketa Konsumen (BPSK)." *Reformasi Hukum, Vol. XXI No. 1*, 2017. Page. 110.

Tabel 1. Comparison of Simple Court vs. Reality of E-Commerce Disputes

Procedural Elements	Simple Court	E-Commerce Dispute Reality
Jurisdiction	Domicile of the defendant	Inter-provincial/international
Presence	Physical presence assumed	Long-distance/asynchronous
Evidence	Physical documents/formal witnesses	Digital logs/screen captures/unboxing videos
Cost Proportionality	Low for local disputes	Very high for long-distance disputes

Source: prepared & processed by the author from various references

B. Policy Learning from the European Union Model and the Ideal Architecture Design of ODR Regulation in Indonesia

1. Legal Analysis of European Union Regulations

The European Union builds the consumer ODR architecture on two complementary legal instruments: Regulation (EU) No 524/2013 on consumer ODR and Directive 2013/11/EU on consumer ADR. The core element of this system is the ODR platform as a Single Point of Entry a multilingual digital portal that automatically directs consumer claims to accredited ADR bodies based on geolocation and industry sector, without the consumer needing to understand the legal system of the seller's country.[14]

The dispute resolution mechanism on this platform operates within three binding algorithmic deadlines: 30 days for initial negotiations and the determination of the agreed ADR body; 3 weeks for the ADR body to confirm its jurisdiction; and a maximum of 90 days for full resolution from the date the case file is received. Additionally, the aspects of identity authentication and the validity of electronic evidence are secured by the eIDAS Regulation (No 910/2014), which establishes four digital trust services: (a) electronic signatures equivalent to handwritten signatures; (b) electronic corporate seals; (c) electronic time stamps to prevent manipulation of the chronology of evidence; and (d) electronic registered delivery services that ensure legal proof of the dispatch and receipt of notifications.[15]

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[14] Wulandari, Yudha Sri dan Rismansyah. "Perlindungan Hukum Terhadap Konsumen Dalam Transaksi Elektronik di Indonesia: Tantangan dalam Implementasi." *The Juris, 9(2),* 2025. Page. 527.

[15] Alamsyah, Sakti dan Fauzie Yusuf Hasibuan. "Legal Protection for Consumers in E-Commerce Transactions in Indonesia." *PENA LAW International Journal of Law, 3(1),* 2025. Page. 14.

2. Lesson from the European Union Model Failure

The European Union model's fundamental failures cannot be disregarded in an honest analysis. The European Union's ODR platform was officially closed irrevocably in July 2025 by Regulation (EU) 2024/3228.[16] The primary factor is not the technical design, but rather the voluntary nature of business participation. The consequences are significant: only approximately 2% of the complaints submitted to the platform are effectively escalated to formal ADR procedures, resulting in the resolution of only approximately 200 cases annually throughout the European Union. The platform, which incurs operational costs of 2-3 million Euros annually, is not a genuine instrument of justice due to the fact that businesses have the option and indeed do to decline to participate.[17]

3. Reconstruction of ODR Regulations in Indonesia

Based on this comparative study, the ideal ODR regulation for Indonesia should be built on three mutually supportive pillars, learning from the failures of the European Union and integrating them into the socio-legal-technological context of Indonesia:

I. Normative Pillar

Fundamentally different from the European Union's voluntary model, Indonesia must impose a mandatory obligation on all large-scale e-commerce platforms to integrate with the national ODR system. This obligation must be enshrined in a lex specialis the Digital Consumer Dispute Resolution Act which comprehensively defines ODR, sets minimum procedural standards, and regulates sanctions for non-compliant platforms.

II. Techincal Pillar

Indonesia needs to build a centralized ODR platform that applies the principle of Regulation by Design where compliance with procedural standards is directly embedded in the technical architecture of the system. A crucial aspect missing in the EU model is identity verification: the Indonesian platform must integrate direct legal subject identity authentication with national population data (Dukcapil/DISDUKCAPIL), thereby closing the gap of identity fraud without requiring any printed documents.[18]

III. Ecosystem Pillar

Instead of dissolving BPSK, Indonesia needs to transform the role of regional BPSK into a standardized digital dispute resolution authority operating within the national ODR ecosystem. Digital BPSK decisions must be automatically executable thru escrow mechanisms or smart contracts

[16] Rafal Morek, "End of an Era: From Clicks to Complaints – What the EU ODR Platform's Closure Means for Businesses and Consumers?," Kluwer Mediation Blog, diakses 15 November 2025.
[17] European Commission. 2023. Report on the Application of Directive 2013/11/EU and Regulation (EU) No 524/2013, COM(2023) 648 final.
[18] Regulation (EU) No 910/2014 (eIDAS)

integrated with e-commerce payment systems, addressing the weaknesses of conventional BPSK that rely on fiat execution by the District Court.[19]

The European Union uses a unified platform free from jurisdictional barriers, whereas Indonesian regulations are still fragmented at the BPSK with physical presence constraints and domicile limitations. This gap has serious implications in the form of procedural violations and denial of justice for cross-regional digital consumers in Indonesia. In addition, the European Union provides a centralized evidence upload system with clear validity guidelines, while electronic evidence tools in Indonesia do not yet have specific operational standards for non-litigation disputes.[20]

In terms of legal subject certainty, the European Union relies on the eIDAS Regulation infrastructure to ensure cross-border authentication, while the ecosystem in Indonesia remains fragmented, making it vulnerable to identity manipulation. Lastly, the European Union strictly enforces dispute resolution duration limits thru a binding algorithmic system, whereas normative deadlines in Indonesia are often exceeded due to bureaucratic obstacles and distance, leading to delayed justice.[21]

Referring to Brownsword's framework on Law 3.0, Indonesia's commitment to cyber justice must be manifested not only in normative legal texts but also in the technical architecture that makes it executable in reality. As long as ODR regulation is not embedded in platform design (Regulation by Design), digital consumer rights will forever remain an unenforceable normative promise.[22]

IV. CONCLUSION

The positive civil procedural law framework in Indonesia from the principle of the defendant's domicile in Article 118 paragraph (1) of the HIR to the analog and pre-digital BPSK mechanism experiences a paradigmatic failure that cannot be resolved with mere partial reforms. This system is designed for the physical-local world, while digital consumer disputes are cross-border, asynchronous, and based on trust in digital information. The design mismatch, exacerbated by a 73% budget cut for BPKN in 2025, creates a legal vacuum that violates consumers' constitutional right to justice and perpetuates rational apathy as a logical response to a disproportionate system. As a result, the country's digital sovereignty has been quietly eroded by opaque and unaccountable internal platform dispute resolution mechanisms.

Selective adoption of the European Union model learning from the critical failure of its voluntary nature that led to the platform's closure by July 2025 offers

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[19] CMS. 2025. "The ODR Platform is Closing – What Businesses Need to Know." 5 February 2025. https://cms.law/en/nld/legal-updates/the-odr-platform-is-closing.
[20] Sudiarawan et al "Formulation of Online Dispute Resolution," (2024), Page. 228.
[21] Umar Mubdi & Martina Trikusrahayu, "Indonesia's Settlement Procedure of Small Claims: A Proposal for the Implementation of Online Dispute Resolution," *Indonesian Journal of Advocacy and Legal Services 6, no. 1.* (2024) Page 53
[22] Palanissamy et al. "Redressal of Disputes Using Online Dispute Resolution," *Advances in Science, Technology and Innovation.* (2024), Page. 107

valuable lessons for Indonesia. The ideal ODR regulation for Indonesia is not merely to imitate but to surpass: adopting the technical architecture of eIDAS while integrating it with the national population identity (Dukcapil); taking the EU single point of entry model but making it mandatory for all large-scale e-commerce; and transforming BPSK into a standardized digital authority whose decisions can be executed automatically. Only with a three-pillar approach normative, technical, and ecosystem can the right to digital consumer redress transition from a passive norm on paper to a technical reality felt by every Indonesian citizen engaging in digital transactions.

Suggestion:

a. For Legislators: Immediately prioritize the ratification of the Draft Law on Digital Consumer Dispute Resolution, which is lex specialis ODR, with mandatory compliance requirements for all large-scale e-commerce platforms, a comprehensive operational definition of ODR, minimum procedural standards, and a sanction mechanism for violators.
b. For the Judicial and Executive Authorities: The Supreme Court needs to reform regulations to recognize unboxing videos and encrypted digital logs as independent evidence without requiring expensive digital forensics. The Ministry of Trade, together with the Ministry of Communication and Digital, needs to launch a pilot project for the digitalization of ODR in five major cities as an empirical basis for the formation of national regulations.
c. For Academics: Encouraging further interdisciplinary research on mitigating algorithmic bias (black box problem) in artificial intelligence systems that act as the "Fourth Party" in digital mediation and arbitration processes, to ensure that algorithmic efficiency does not sacrifice consumer procedural fairness.

REFERENCES

Hanida, Dian. "Penerapan Online Dispute Resolution (ODR) dalam Upaya Penyelesaian Sengketa E-Commerce di Indonesia." *YUSTISI*, 2023. page. 31.

Kenza Radhya E. A."Online Dispute Resolution Sebagai Alternatif Penyelesaian Sengketa Fintech Di Era Industri 4.0," *Jurnal Kewarganegaraan* (2023), Page 2056.

Antara News, "Anggaran BPKN Dipangkas Sekitar 73 Persen Akibat Efisiensi Belanja," 13 February 2025; JPNN.com, "Anggaran BPKN Sisa Rp 2,3 M setelah Kena Efisiensi 73 Persen," 13 February 2025.

Richard Susskind, Online Courts and the Future of Justice Oxford: Oxford University Press, 2019, Page. 66.

Ethan Katsh dan Janet Rifkin, Online Dispute Resolution: Resolving Disputes in Cyberspace. San Francisco: Jossey-Bass, 2001, Page. 15.

Lawrence Lessig, Code and Other Laws of Cyberspace New York: Basic Books, 1999, Page. 4.

Roger Brownsword, Law 3.0: Rules, Regulation, and Technology Abingdon: Routledge, 2020, Page 15.

Aziz, Muhammad Faiz dan Muhammad Arif Hidayah. "Perlunya Pengaturan Khusus Online Dispute Resolution (ODR) di Indonesia untuk Fasilitasi Penyelesaian Sengketa E-Commerce." RECHTS VINDING, 2020. Page. 275.

Ilham Bagaskara Aji dan Pujiyono, "Problematika Hukum Arbitrase Online Menurut UU No. 30 Tahun 1999 tentang Arbitrase dan Alternatif Penyelesaian Sengketa," Jurnal Privat Law, 2020, Page. 341

Shidarta, "Hukum Perlindungan Konsumen" Indonesia Jakarta: Grasindo, 2000, Page. 15.

Prabowo, Muchammad Shidqon dan Dewi Sulistianingsih. "The Powerlessness of BPSK in Digital Consumer Protection." Journal of Consumer Law and Policy, 2023, Page. 14.

Purwoko, A. Joko. "Optimalisasi Badan Penyelesaian Sengketa Konsumen (BPSK) sebagai Lembaga Penyelesaian Sengketa Konsumen di Luar Pengadilan." Unisbank Semarang, 2016. Page. 414.

Dwinanda, Sahlevi. "Perbandingan Efektivitas Penyelesaian Sengketa Konsumen pada Pengadilan Negeri dan Badan Penyelesaian Sengketa Konsumen (BPSK)." Reformasi Hukum, Vol. XXI No. 1, 2017. Page. 110.

Wulandari, Yudha Sri dan Rismansyah. "Perlindungan Hukum Terhadap Konsumen Dalam Transaksi Elektronik di Indonesia: Tantangan dalam Implementasi." The Juris, 9(2), 2025. Page. 527.

Alamsyah, Sakti dan Fauzie Yusuf Hasibuan. "Legal Protection for Consumers in E-Commerce Transactions in Indonesia." PENA LAW International Journal of Law, 3(1), 2025. Page. 14.

Rafal Morek, "End of an Era: From Clicks to Complaints – What the EU ODR Platform's Closure Means for Businesses and Consumers?," Kluwer Mediation Blog, diakses 15 November 2025.

European Commission. 2023. Report on the Application of Directive 2013/11/EU and Regulation (EU) No 524/2013, COM(2023) 648 final.

Regulation (EU) No 910/2014 (eIDAS)

CMS. 2025. "The ODR Platform is Closing – What Businesses Need to Know." 5 February 2025. https://cms.law/en/nld/legal-updates/the-odr-platform-is-closing.

Sudiarawan et al "Formulation of Online Dispute Resolution," (2024), Page. 228.

Umar Mubdi & Martina Trikusrahayu, "Indonesia's Settlement Procedure of Small Claims: A Proposal for the Implementation of Online Dispute Resolution," Indonesian Journal of Advocacy and Legal Services 6, no. 1. (2024) Page 53

Palanissamy et al. "Redressal of Disputes Using Online Dispute Resolution," Advances in Science, Technology and Innovation. (2024), Page. 107