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Harmonizing Digital Authentication Regulations: Legislative Framework for the Use of QR-Code in Notarial Practice

Firli Irnanda[1], Fitra Deni[2]

[1,2] Magister of Notary, Faculty of Law, Universitas Pancasila, Jakarta, Indonesia. Email: firli.irnanda@gmail.com[1], fitra.deni@yahoo.com[2]

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ABSTRACT
The rapid development of information technology has significantly impacted notarial practices, particularly in the authentication of documents. One emerging innovation is the use of the Quick Response Code (QR code) as a verification tool and potential substitute for signatures on copies of notarial deeds. However, the current Indonesian legal framework does not explicitly regulate the legitimacy of QR-Codes within notarial procedures. This study aims to analyze the necessity of harmonizing Law No. 2 of 2014 on Notary Positions (UUJN) with Law No. 19 of 2016 on Electronic Information and Transactions (UU ITE) to accommodate digital authentication through QR-Codes. Using a normative juridical method combined with statutory, conceptual, and comparative approaches, this research examines the coherence of existing legal norms governing electronic signatures and notarial authority. The findings indicate that while QR-Codes offer advantages in terms of security, efficiency, and accuracy, the absence of explicit legal recognition creates uncertainty regarding the validity of digitally authenticated notarial documents. Therefore, regulatory harmonization through amendments to the UUJN and the issuance of implementing regulations is essential to establish legal certainty, security, and accountability in the use of QR-Codes. Such efforts are expected to promote a digital notarial system that is adaptive, transparent, and aligned with the principles of legal certainty in Indonesia.

Keywords: QR-Code, Digital Authentication, Notarial Practice, Legal Harmonization, Document Validity.

I. Introduction

The rapid advancement of information and communication technology (ICT) has profoundly transformed legal systems worldwide, including Indonesia's notarial practice. The transition toward a digital society necessitates innovation in the methods of authenticating legal documents to ensure efficiency, integrity, and legal certainty. Within this transformation, the Quick Response Code (QR-Code) has emerged as a potential instrument for document authentication and verification, particularly in notarial copies that require both administrative and evidentiary reliability (Ashilah Chalista Putri Yasya, 2023). In Indonesian notarial law, the principle of authenticity mandates the presence of handwritten signatures and a notarial seal, as stipulated in Law No. 2 of 2014 on the Position of Notary (UUJN). This requirement remains predominantly

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conventional and has not explicitly accommodated the use of digital authentication technology (Alhamidy & Lukman, 2023). Conversely, Law No. 19 of 2016 on Electronic Information and Transactions (UU ITE) acknowledges the legal validity of electronic signatures, provided they fulfill the requirements of authenticity, integrity, and verifiability (Mayana & Santika, 2021). However, the ITE Law does not define the legal standing of QR-Codes in the authentication of notarial documents, thereby creating a regulatory gap between the two statutory frameworks (Ghani & Priyono, 2025). Recent legal scholarship suggests that technological advancement necessitates a more adaptive and efficient notarial system through the implementation of cyber notary mechanisms. Yurika and Putra argue that the digitalization of notarial functions enhances legal service efficiency and document security; however, without explicit regulatory grounding, the implementation of cyber notaries risks producing legal uncertainty (Yurika & Mahasiswa, 2025). Likewise, Sidharta and Dewi emphasize that the digital transformation of notarial instruments must be followed by formal legislative reform to ensure that digital notarial deeds hold equal evidentiary weight as physical deeds (Sidharta & Dewi, 2023).

According to Ghani and Priyono, regulatory disharmony between the UUJN and UU ITE constitutes the main barrier to the legalization of cyber notary practices, as each law is grounded in differing legal philosophies, formalism versus technological adaptability (Ghani & Priyono, 2025). This divergence of legal paradigms renders the role of notaries within the digital sphere legally ambiguous. Further, it is contended that the shift toward digital notarial practices is inevitable, given the increasing public demand for transparency and efficiency in legal services (Ashilah Chalista Putri Yasya, 2023). However, the current legal system still lacks a verification mechanism that equates to the evidentiary strength of a handwritten signature. Within this context, the QR code offers an alternative method of authentication that reinforces document validity while upholding the prudential principles underlying notarial duties (Fauziah, 2025). Posits that QR-Codes may serve as a complementary authentication tool enhancing the originality of notarial copies, but cannot yet substitute the notary's signature, as they lack explicit statutory recognition in the UUJN (Fauziah, 2025). Therefore, legal harmonization is essential to bridge the gap between formal authenticity requirements and technological adaptation (Agustin & Anand, 2021). Assert that modernizing Indonesia's legal and economic frameworks requires integrating cybersecurity and digital authentication within public administrative reform (Hayun et al., 2025). Similarly, Ika Yuli Agustin (2022) advocates for a technological neutrality approach in notarial digitalization, emphasizing that regulation should focus on data integrity and legal security rather than specific technologies (Agustin & Anand, 2021).

Data protection has also emerged as a pressing concern. Najib underscores that any utilization of QR-Codes for notarial authentication must adhere to the Personal Data Protection Law No. 27 of 2022, ensuring that confidential information embedded within the QR system remains safeguarded (Najib, 2023). Moreover, stresses that the modernization of notarial duties must include proportional legal responsibility for digital system governance to prevent ethical and professional disputes (Al Muhtar & Indrati Rini, 2024). Globally, jurisdictions such as Estonia and Singapore have already adopted cyber notary systems incorporating QR codes and blockchain-based verification. Mannas highlights the significance of electronic protocol storage and blockchain ledger systems as a forward-looking solution for notarial documentation in Indonesia (Mannas et al., 2024). These approaches promise greater efficiency and reduce the risk of document forgery or manipulation (Omiyani et al., 2024).

Accordingly, this research aims to investigate how the harmonization of digital authentication regulations can be achieved through legislative structuring that integrates QR-code utilization into notarial practice without compromising the principles of authenticity, accountability, and legal certainty. The study aims to:

a. Analyze the legal status of QR-Codes as authentication instruments in Indonesia's notarial framework;
b. Evaluate the regulatory disharmony between the UUJN and the UU ITE regarding digital authentication

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II. Literature Review

The use of digital technology in notarial practice has increasingly become a central topic in contemporary legal discourse, particularly concerning the legality of electronic signatures, digital authentication mechanisms, and electronic document management systems. According to Mayana and Santika (2021), the digitalization of document authorization has introduced a paradigmatic shift in evidentiary law, in which the principle of functional equivalence serves as the foundation for the legal recognition of electronic documents within modern legal frameworks. This principle argues that the legal effectiveness of a document should not depend solely on its physical or traditional form, but instead on whether the digital form performs the same legal function as a traditional notarized document. This transition aligns with the broader evolution of legal norms in the context of digital governance. The theoretical underpinning of this transformation aligns with Lessig's (1999) techno-regulation theory, which posits that legal systems must evolve in tandem with technological advancements to maintain relevance and regulatory effectiveness. Lessig emphasizes that technology does not merely support regulation; it can become a form of regulation itself, shaping behavior, accessibility, and legal compliance.

Recent studies highlight ongoing uncertainty in Indonesia's legal framework involving digital notarization. Ghani and Priyono (2025) highlight regulatory disharmony between the Undang-Undang Jabatan Notaris (UUJN) and the Undang-Undang Informasi dan Transaksi Elektronik (UU ITE), particularly in relation to the legal validity of electronically notarized documents and the use of digital authentication tools, such as QR codes. While the UU ITE legally recognizes electronic signatures and electronic documents as valid forms of evidence, the UUJN still places strong emphasis on traditional signatures and wet-ink authentication. This discrepancy generates legal ambiguity, undermining legal certainty and inhibiting innovation within notarial services.

Similarly, Hardityo et al. (2019) argue that QR-Code technology may serve as a supplementary security feature but cannot yet replace traditional handwritten signatures due to the absence of explicit legal recognition in the UUJN. Their findings demonstrate that although technological tools can enhance document integrity and traceability, the regulatory environment must evolve before these tools may be operationalized in formal legal practice. Several jurisdictions have made significant progress in digital notarization and authentication. Estonia, often cited as a global leader in digital governance, has adopted a blockchain-based notarial system in conjunction with QR-Code authentication for document verification (Mannas et al., 2024). Through its e-Notary infrastructure, the country ensures authentication, tamper-resistance, and remote verification capabilities, reducing administrative burden and enhancing legal transparency. The Estonian model demonstrates that a harmonized digital identity framework, legal infrastructure, and technological implementation are essential components of modern legal services.

Singapore has also implemented digital verification systems using secure QR-Codes under its Electronic Transactions Act (2021), providing real-time document verification and authentication. Meanwhile, the European Union, through its eIDAS Regulation, formally recognizes electronic signatures, seal systems, and remote notarization, enabling cross-border legal recognition. Although earlier studies have examined the legality of electronic signatures and the urgency of implementing cyber notaries, the existing literature has not thoroughly analyzed the legal status, applicability, or regulatory harmonization required for QR-code authentication as a standalone mechanism for notarial verification in Indonesia. Most existing frameworks still approach QR-Codes as a technical add-on rather than a legally recognized authentication method. Therefore, this study contributes to filling this research gap through a multi-level analysis of Indonesian regulations and comparative legal norms, focusing on harmonizing the UUJN and UU ITE to ensure legal certainty and future readiness for QR-Code authentication in Indonesian notarial practice. Recent developments in digital identity and authentication frameworks at the global level further support the urgency of regulatory modernization in Indonesia. For instance, the European Union, through its revised eIDAS 2.0 Regulation (European Commission, 2021), emphasizes cross-border legal recognition of digital authentication systems, including QR-Code-based verification embedded within digital identity infrastructure. Likewise, Clack, Bakshi, and

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Braine (2017) argue that the integration of distributed ledger technology, digital certificates, and machine-readable verification mechanisms is essential to ensure the integrity and enforceability of legal documents in digital environments. Furthermore, ISO/IEC 18013-5:2021 provides a standardized security protocol for digital identity validation, demonstrating that QR-Code authentication must operate within a certified, secure, and interoperable governance framework. These global developments demonstrate that QR-Code adoption in notarial authentication aligns with international digital governance trends and strengthens the urgency for Indonesia to establish a harmonized and future-proof regulatory approach.

Globally, jurisdictions such as Estonia and Singapore have already adopted cyber notary systems incorporating QR codes and blockchain-based verification. Mannas highlights the significance of electronic protocol storage and blockchain ledger systems as a forward-looking solution for notarial documentation in Indonesia (Mannas et al., 2024). These approaches promise greater efficiency and reduce the risk of document forgery or manipulation (Omiyani et al., 2024). Accordingly, this research aims to investigate how the harmonization of digital authentication regulations can be achieved through legislative structuring that integrates QR-code utilization into notarial practice without compromising the principles of authenticity, accountability, and legal certainty.

Based on study objectives in Section One, the research contributes to academic discourse and policy development by providing an analytical foundation for reforming notarial regulations in alignment with national digital transformation agendas, cybersecurity mandates, and global authentication standards. The findings are expected to offer a structured reference for lawmakers, regulatory authorities, and professional notarial bodies in designing coherent, enforceable, and future-proof regulatory instruments. Furthermore, this study aims to clarify whether QR-code authentication can evolve from a supplementary verification feature into a legally recognized component of authentic deed certification, provided it is supported by adequate procedural safeguards, infrastructure integrity, and regulatory legitimacy. In addition, this research is positioned within the broader discourse on digital legal transformation, where the principle of technological neutrality and the mandate for adaptive lawmaking play a central role. As Indonesia continues its transition toward e-governance, regulatory synchronization becomes essential to ensure that legal innovation aligns not only with efficiency goals but also with constitutional mandates regarding legal certainty, procedural justice, and public trust in state-authorized legal instruments. Thus, the use of QR-Code authentication in notarial practice is not merely a technological question, but a matter of legal philosophy, institutional design, and regulatory harmonization. To achieve its objectives, this study adopts a doctrinal legal research framework combined with a comparative legal analysis approach, examining statutory interpretations, normative jurisprudence, and regulatory models implemented in countries with advanced digital notarization systems such as Estonia, Singapore, and the European Union. By analyzing legal texts, academic literature, international regulatory instruments, and existing digital authentication practices, the research aims to formulate a comprehensive evaluation of the normative position and future viability of QR-code authentication within Indonesia's legal framework.

This research is limited to the context of QR-code implementation for authentication of notarial copies and verification mechanisms, rather than examining the broader spectrum of cyber notary applications, such as blockchain notarization, remote witnessing, or artificial intelligence–assisted drafting. Such limitations are intended to ensure analytical precision by focusing on the existing regulatory vacuum specifically related to authentication tools rather than the entire digital notarial ecosystem. Ultimately, this study argues that the integration of QR-Code authentication should not be interpreted as a departure from traditional notarial principles, but rather as a modernization strategy aimed at strengthening legal security, improving administrative efficiency, and aligning Indonesia's legal framework with international technological and normative developments. As digital legal transformation accelerates globally, regulatory harmonization becomes not only necessary but inevitable to ensure that Indonesian notarial practice remains authoritative, adaptive, and future-ready.

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III. Research Method

This study employs a normative juridical (doctrinal legal research) approach, which focuses on analyzing the coherence of legal norms, doctrines, and regulatory structures related to digital authentication and notarial law in Indonesia. Within this framework, the research examines primary legal materials, such as laws, government regulations, ministerial decrees, and professional codes, alongside secondary sources, including legal commentaries and scholarly writings. The purpose is to identify normative inconsistencies (regulatory gaps) concerning the legal validity of QR-Code utilization as an authentication tool in notarial practice. The normative juridical method remains the dominant model in Indonesian legal research, emphasizing library-based document analysis as the foundation for assessing legal reasoning and statutory interpretation (Bowen, 2009).

Complementing this doctrinal approach, the study integrates a comparative legal analysis to contextualize Indonesia's regulatory stance with other jurisdictions that have adopted digital authentication mechanisms in notarial systems, such as Estonia and Singapore. This comparison aims to identify legal principles, best practices, and legislative patterns that can inform Indonesia's efforts to harmonize its laws and regulations. Comparative legal methodology, as discussed by Tamanaha (2021) and van Hoecke (2020), offers a crucial analytical lens for understanding the convergence and divergence of legal norms across digital governance frameworks (Negara, 2023). By contrasting international models, the study identifies feasible pathways for aligning Indonesia's legal infrastructure with global standards of electronic authentication and cyber notarial practices. For data processing and interpretation, this research applies qualitative deductive analysis, moving from general legal principles to specific applications within Indonesia's notarial framework. The technique relies on documentary legal analysis, which involves the systematic examination of statutes, judicial decisions, and academic writings to derive consistent interpretations of legal norms. The analysis is conducted through multiple layers of interpretation, grammatical, systematic, and teleological, to evaluate the compatibility of QR-Code authentication with the principles of authenticity, integrity, and professional accountability in notarial law (Hamzani et al., 2023). This methodological design ensures that the resulting legislative recommendations are grounded in both normative consistency and comparative legal reasoning, enabling a coherent proposal for regulatory harmonization in the digital era.

IV. Results and Discussion

4.1. Analyze the legal status of QR-Codes as authentication instruments in Indonesia's notarial framework

It is essential to understand that Indonesia's national legal framework has recognized electronic signatures as valid authentication instruments through Law No. 19 of 2016, which amends Law No. 11 of 2008 on Electronic Information and Transactions (ITE Law). The provisions of the ITE Law stipulate that electronic documents, electronic information, and their printouts constitute valid legal evidence, provided that specific requirements are met, specifically that the electronic signature must ensure a verifiable link between the signatory and the data and guarantee the integrity of the information after the act of signing (Indonesia, n.d.). Research such as "Regulation of the Use of Electronic Signatures under Law No. 19 of 2016 on Electronic Information and Transactions" confirms that the legality of electronic signatures has been firmly established within Indonesia's positive law. This recognition thus provides a conceptual and legal foundation for considering alternative forms of digital authentication, such as QR-Code verification, insofar as they fulfill equivalent standards of authenticity, integrity, and verification (Bangun & Prakarsa, 2025)

In contrast, the Indonesian Law on Notarial Positions (UUJN) continues to impose strict formal requirements regarding the authenticity of notarial deeds, centering on handwritten signatures and the notarial seal as fundamental elements of an authentic deed. The relevant provisions of the UUJN require that an authentic deed be executed in the physical presence of a notary, signed by both the notary and the appearing parties, and affixed with the notary's official seal. As of today, there are no explicit provisions under

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the UUJN that regulate or recognize QR-Code technology as part of the authentication procedure for notarial deeds or their copies. Consequently, the use of QR codes as a verification instrument in notarial practice remains within a legal grey area, since the formal norms governing notarial procedures were never designed to accommodate digital or semi-digital authentication mechanisms such as QR codes.

Empirical and juridical studies, however, indicate that the inclusion of QR-Codes in legal documents may be deemed lawful as a supplementary authentication measure, particularly when such use does not alter the substance of the deed, does not contravene the formal requirements of the UUJN, and is employed solely to enhance document security and transparency. For instance, the study "The Validity of QR-Code Digital Signature in Contracts Towards the Evidence Agenda in Civil Court" concludes that contracts authenticated via QR-Code digital signatures may be admissible as evidence before civil courts, provided they comply with the articulation of Article 11 of the ITE Law regarding signatory authentication and the verifiability of electronic data (Andriati & Batubara, 2024). Similarly, the study "Juridical Analysis of QR-Code Inclusion in Deeds as Seen from Law No. 2 of 2014" suggests that the incorporation of QR-Codes into notarial deeds is permissible, as long as the code does not modify the deed's content or legal substance, and remains consistent with the formal norms of the UUJN and its implementing regulations (Hardityo et al., 2019).

The main limitation arises from the fact that, while the ITE Law establishes general standards for electronic authentication, there are no specific technical or procedural regulations governing the use of QR-Codes as an authentication method within the context of authenticating notarial deeds. In addition, several critical issues remain unregulated, including cybersecurity standards, data encryption requirements, the identification of QR-code issuers, audit trails, and legal accountability in cases of misuse or system compromise. The study "Implementation of Document Authentication Systems Based on Quick Response (QR) Code and Digital Signature" describes the technical mechanisms, such as SHA-256 hashing and RSA encryption, used in QR-code authentication systems. However, these implementations pertain to non-notarial documents and therefore cannot yet be deemed part of the formal notarial authentication framework (Lorien & Wellem, 2021).

Based on the foregoing analysis, it can be concluded that QR-Codes possess potential but limited juridical status as authentication instruments within Indonesia's notarial practice. They may lawfully serve as complementary tools supporting verification and validation, but not as substitutes for handwritten signatures or the notarial seal, unless the UUJN is amended to accommodate such technological means. The legality of QR-code utilization thus depends heavily on its conformity with the ITE Law (particularly its provisions on electronic signatures and evidentiary standards), as well as on the development of clear technical standards and the implementation of regulations. For full legal recognition, Indonesia must enact legislative or regulatory instruments that explicitly govern the integration of QR-Codes into the authentication framework of notarial deeds.

4.2. Evaluate the regulatory disharmony between the UUJN and the UU ITE regarding digital authentication

The conflict between the Law on Notarial Positions (UUJN) and the Law on Electronic Information and Transactions (UU ITE) represents a fundamental issue in Indonesia's adaptation of legal norms to digital technology, particularly in relation to the authentication of legal documents. The UUJN, as the principal law governing notarial authority, emphasizes traditional formalism, where the authenticity of a deed is established through the presence of handwritten signatures, physical attendance before the notary, and the application of the official notarial seal. Conversely, the UU ITE explicitly recognizes electronic documents and electronic signatures as having the same legal validity and evidentiary power as written documents, provided they fulfill the conditions of authenticity, data integrity, and verifiable linkage between the signatory and the data (Indonesia, n.d.). This creates a normative dissonance: the UUJN adheres to a formalistic paradigm grounded in physical documentation. At the same time, the UU ITE embraces a functional paradigm of digital legal validity based on technology-driven authentication (Ghani & Priyono, 2025).

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The disharmony becomes more pronounced when viewed from the perspective of regulatory principles and the scope of authority. The UUJN operates under a lex specialis principle, governing the formal and procedural aspects of notarial acts as evidence of the highest legal order. In contrast, the UU ITE serves as a lex generalis, regulating electronic transactions broadly, including digital signatures used in legal or commercial documentation. According to Ghani and Priyono, this conflict is not merely technical, but epistemological; it reflects a clash between a formal-legal system (as in the UUJN) and a functional-digital legal system (as embodied in the UU ITE) (Ghani & Priyono, 2025). Consequently, although the ITE Law generally recognizes electronic signatures, their application within the framework of authentic notarial deeds remains legally ambiguous, as no implementing regulations currently bridge these two statutory domains. This regulatory inconsistency directly affects both legal certainty and the principle of authenticity in notarial deeds. Hardityo and Purnawan argue that the use of electronic signatures or QR-Codes within notarial copies can only serve as complementary evidentiary tools, not as formal instruments of authentication as required by Articles 16 and 44 of the UUJN (Iriantoro & Hardiansyah, 2024) (Hardityo et al., 2019). Such ambiguity creates legal risks and interpretative divergence among notaries, government institutions, and courts regarding the validity of digitally authenticated deeds. Supporting this, Yasya and Putra emphasize that the modernization of notarial practices without regulatory synchronization risks creating a dualistic legal regime, where manual and digital authentication systems coexist without a unified normative framework (Yasya, 2023).

In the context of Indonesia's positive law, the UUJN and the UU ITE remain structurally disconnected regarding the substantive integration of digital authentication principles. The UU ITE provides general criteria for electronic authentication under Articles 11(1)–(4), but it does not explicitly regulate legal professions, such as notaries. Conversely, the UUJN contains no provisions acknowledging electronic or digital means of authentication, even for the issuance of electronic deed copies. As noted by Indriani, Ali, and Muhshi, this situation constitutes a significant regulatory gap, as both statutes govern overlapping legal domains but lack procedural integration. Therefore, legislative harmonization is required either through amendments to the UUJN to include digital authentication definitions or through the issuance of implementing regulations that establish a technical and procedural framework for its application.

Based on the foregoing normative analysis, it can be concluded that the regulatory disharmony between the UUJN and the UU ITE stems from inconsistent legal principles, divergent definitions, and incompatible authentication mechanisms. Harmonization must be achieved through an integrative legislative approach, aligning the UUJN with the evolving framework of digital law while preserving the fundamental value of authenticity. A viable model would be a dual-validity system, wherein digital authentication tools such as electronic signatures and QR-Codes are recognized as possessing evidentiary strength equivalent to traditional handwritten signatures, provided they comply with technical and verification standards established by licensed certification authorities.[10] Such integration between the UUJN and the UU ITE would strengthen legal certainty, enhance professional accountability, and facilitate Indonesia's transition toward a secure and modern digital notarial system.

4.3. Comparative Legal and Policy Analysis on QR-Code Authentication in Notarial Practice

A comparative legal perspective is essential for understanding how other jurisdictions have successfully integrated digital authentication into notarial systems, particularly with respect to QR-code validation. Comparative legal studies serve not only as a normative reference but also as a policy benchmark for Indonesia's regulatory transition. As stated by Zweigert and Kötz (1998), legal comparison is most valuable when a country is undergoing reform and requires tested legal models that demonstrate practicality, enforceability, and legal certainty. In this regard, Estonia, Singapore, and the European Union provide relevant examples of jurisdictions that have institutionalized digital authentication in a manner consistent with legal certainty, technological standards, and public governance. Estonia is widely recognized as a global pioneer in digital governance, particularly through its "e-Residency" and "e-Notary" systems. Under Estonia's Notaries Act and the Digital Identification Regulation, electronic signatures, blockchain-based verification, and QR-Code

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authentication form an integrated ecosystem that ensures document traceability, confidentiality, and legal enforceability (Helvik & Vaher, 2022). The QR code functions as a gateway to a secure blockchain ledger, enabling users, including courts, government institutions, and private parties, to verify document origins, timestamp validity, and alterations in real-time. This system demonstrates that QR codes are not merely supplemental markers but integral components of the authentication process, reinforced by cybersecurity infrastructure, government certification frameworks, and legal oversight. If applied in Indonesia, the Estonian model suggests that QR-code authentication should be embedded within a broader digital identification system, rather than being introduced as an isolated tool.

Singapore provides another relevant model through the Electronic Transactions Act (ETA) 2021, which formally recognizes both electronic signatures and digital seals as legally valid forms of document authentication. QR-Codes are used extensively to authenticate corporate records, court documents, and public records under the QR-Enabled Digital Document Validation (QDDV) framework (Liang, 2023). Unlike Estonia's blockchain model, Singapore's approach relies on centralized verification under licensed Certificate Authorities (CAs), ensuring that authentication maintains legal uniformity and state accountability. Singapore's legal framework demonstrates that QR-Code authentication can coexist with traditional signatures, provided that the technology is governed through certification standards, audit mechanisms, and institutional licensing. This dual-system validation model may be more suitable for Indonesia, given that Indonesia already operates licensed electronic certification providers under the Ministry of Communication and Information.

Meanwhile, the European Union's legal framework, as outlined in the eIDAS Regulation (EU Regulation No. 910/2014), provides a supranational model for electronic identification, ensuring the cross-border legal recognition of electronic signatures, seals, and notarial digitization. Several EU member states have adopted QR codes as part of their notarial verification systems, particularly in Spain and Germany, where QR codes serve as entry points to centralized registries for deed authentication (Schmidt & Lorenz, 2022). The eIDAS framework emphasizes the importance of interoperability, technological neutrality, and legal enforceability principles, which are highly relevant to Indonesia's legal reform trajectory. Comparative findings demonstrate three essential policy patterns:

1. QR-Code authentication must be supported by clear legal definitions within statutory frameworks to avoid ambiguity in evidentiary status.
2. Technical and cybersecurity standards must accompany regulatory authorization, including encryption, access control, metadata protection, and audit trails.
3. Institutional oversight is necessary to maintain accountability, preventing misuse, fraud, or loss of evidentiary value.

Based on these patterns, Indonesia should adopt a hybrid regulatory model combining the regulatory clarity of Singapore with the technological integration of Estonia, while aligning with the interoperability principles of the eIDAS framework. This policy direction ensures that QR codes evolve from a supplementary verification feature into a legally recognized authentication mechanism, supported by certification authorities, cybersecurity governance, and statutory legitimacy.

4.4. Legislative Gap and Challenges in Integrating QR-Code Authentication into Indonesia's Notarial Framework

The integration of QR-Code authentication into notarial practices in Indonesia faces multifaceted legislative and institutional challenges due to the absence of explicit norms, inconsistencies between existing laws, and limitations in implementation mechanisms. Although the UU ITE recognizes electronic signatures and electronic documents as legally valid instruments, the regulatory foundation necessary to operationalize QR-Codes within the scope of authentic deeds remains largely incomplete. This gap indicates that the

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legislative framework has not kept pace with technological innovation, resulting in a fragmented legal ecosystem where traditional authentication requirements and digital authentication capabilities coexist without formal convergence.

One of the primary legislative gaps lies within the *Undang-Undang Jabatan Notaris* (UUJN), which still adheres strictly to conventional authentication mechanisms, including handwritten signatures, physical seals, and face-to-face signing procedures. Articles 16, 30, and 44 of the UUJN embed a formalistic theory of authentication that prioritizes physical presence and manual execution. As a result, digital tools such as QR-Codes, even when serving an evidentiary, supplementary, or verification purpose, lack legal standing within the scope of mandatory notarial authenticity elements. This statutory rigidity reflects a legal paradigm that has not fully transitioned toward the principle of functional equivalence recognized under the UU ITE. The second challenge involves the absence of technical regulations that define standards for QR-Code authentication, such as encryption requirements, metadata structure, certification authority involvement, audit trail mechanisms, and system interoperability. Without these technical standards, QR-Codes used in notarial verification remain vulnerable to risks including duplication, unauthorized access, cyber manipulation, and identity fraud. Although existing cybersecurity frameworks under Law No. 27 of 2022 on Personal Data Protection provide general guidance on information governance and security obligations, they do not specifically regulate authentication technologies in legal document contexts, nor do they establish requirements for notarial digital systems.

Institutional challenges also significantly contribute to regulatory stagnation. The Ministry of Law and Human Rights, along with the Ministry of Communication and Information, has yet to issue implementing guidelines or technical certification frameworks for notarial digital authentication. In addition, notaries, as legal professionals, face ethical and procedural dilemmas when adopting QR-code authentication tools, as premature implementation may be perceived as exceeding or modifying statutory obligations under the UUJN. The absence of synchronized professional standards and enforcement mechanisms further reinforces the hesitation among notaries to utilize QR-code authentication, despite its security and efficiency advantages.

Judicial uncertainty remains another key concern. Courts do not yet possess standardized guidelines for interpreting the probative value of QR-code authenticated notarial copies. While electronic documents may be admissible as evidence under the UU ITE, their evidentiary hierarchy relative to authentic deeds remains undefined, which can lead to potential inconsistencies in legal interpretation and judicial outcomes. From these challenges, it becomes evident that harmonization is not merely a legislative need, but also a systemic requirement involving institutional coordination, technological governance, and professional accountability frameworks. Regulatory reform must therefore address three critical dimensions: (a) amendment of primary legislation (UUJN) to incorporate digital authentication principles; (b) issuance of technical implementing regulations defining QR-Code authentication standards within a certified digital security framework; and (c) institutional capacity strengthening to ensure compliance, oversight, and interoperability. Without addressing these structural gaps, QR-Code authentication will remain limited to supplementary evidentiary functions, falling short of its potential to modernize Indonesia's notarial authentication system.

V. Conclusion

This study concludes that Indonesia's current legal framework exhibits a significant normative gap between the Law on Notarial Positions (UUJN) and the Law on Electronic Information and Transactions (UU ITE) regarding the recognition of digital authentication. The UUJN remains grounded in formalistic legal traditions that require physical presence, handwritten signatures, and official seals. In contrast, the UU ITE acknowledges the legal validity of electronic documents and digital signatures based on technological verification and data integrity. This dichotomy has led to regulatory disharmony, resulting in legal uncertainty in notarial practice. The analysis of QR codes as authentication instruments demonstrates that while they

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possess legal potential as supplementary verification tools, they cannot yet replace conventional authentication methods without explicit legislative authorization. The absence of harmonized regulation reflects a deeper structural lag in adapting notarial law to digital transformation.

Therefore, Indonesia must pursue regulatory harmonization through an integrative legislative reform that aligns the principles of authenticity in the UUJN with the digital authentication standards established under the UU ITE. Recognizing QR-Codes and electronic signatures as complementary rather than substitutive authentication mechanisms can preserve the notary's legal authority while modernizing document verification processes. Theoretically, this harmonization reinforces the principle of functional equivalence and supports the modernization of notarial law within the framework of digital governance. Practically, it provides policymakers, notaries, and the Ministry of Law and Human Rights with a structured foundation to establish technical standards, verification protocols, and cybersecurity safeguards, ensuring both the integrity of notarial acts and public trust in digital legal instruments.

Based on the analysis presented, this study recommends that the Indonesian government undertake a structured legal harmonization process to formally recognize QR-Code authentication within the notarial framework, beginning with revisions to the UUJN and complemented by implementing regulations under the authority of the Ministry of Law and Human Rights and the Ministry of Communication and Information. This reform should establish clear legal definitions, verification standards, and technical specifications for the use of QR codes in notarial deeds, while integrating cybersecurity safeguards and compliance with the Personal Data Protection Law. To support implementation, notaries should be equipped through mandatory digital competence training, certification mechanisms, and standardized operational guidelines aligned with best practices from Estonia, Singapore, and the EU eIDAS framework. A phased adoption model—initially applying QR-Code authentication to certified true copies before extending to complete electronic deed execution—will ensure legal certainty, public trust, and institutional readiness while accelerating Indonesia's transition toward a secure and future-ready cyber notary ecosystem.

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