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Adaptation of Community Innovation in Stamp Digitalization

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ABSTRACT

The rapid digital revolution driven by technological progress has significantly transformed various aspects of daily life, particularly in document authentication and validation. This paper examines the transition from conventional physical stamps to digital stamps (e-stamps) in Indonesia, an innovation developed to modernize administrative processes. Using a qualitative approach within a constructivist framework, the study explores public adaptation to e-stamps by analyzing adoption patterns, digital literacy challenges, and societal perceptions of security, convenience, and effectiveness. Guided by Rogers' Diffusion of Innovation Theory, the research evaluates the strengths and limitations of this transition through five attributes of innovation: relative advantage, compatibility, complexity, trialability, and observability. Data were collected through literature review, interviews with institutional representatives, and focus group discussions involving participants of diverse ages, professions, and digital literacy levels. The findings indicate that although e-stamps offer notable advantages—such as increased efficiency, security, and accessibility—their adoption is hindered by technical difficulties, user resistance, and limited opportunities for practice. Younger and more technologically proficient groups adapt more readily, whereas older or less digitally skilled individuals face significant barriers. The study underscores the need for comprehensive public education, robust technical support, and targeted outreach programs to strengthen adoption. The insights generated provide valuable guidance for policymakers and implementing agencies in enhancing the rollout and equitable access to e-stamps, thereby supporting Indonesia's broader digital transformation in public administration.

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1. INTRODUCTION

The accelerating wave of globalization in the digital era has driven rapid technical innovations, transforming several components of life, particularly in transactions and document administration. In 2023, OECD reported the global leader in digital governance to be Korea, with a staggering score of 0.94 in the Digital Government Index 2023 (*Government at a Glance 2025*, 2025). It was able to achieve this score through measuring the digital by design, open by default, and proactiveness variables from the 2023 Digital Government Index. Countries with similar high scores, Denmark (0.81) and the United Kingdom (0.78), also demonstrate consistently high uptake of digital public services, supported by mature data-sharing systems and universal e-ID utilisation. These global benchmarks highlight how nations with strong digital infrastructure and literacy achieve near-universal adoption of digital administrative tools, contrasting sharply with Indonesia's lower digital literacy index (3.54/5) and ongoing challenges in mainstreaming e-meterai usage (*Government at a Glance 2025*, 2025).

The digital stamps in Indonesia is part of one notable transformation (Abbas & Putra, 2024). It was a groundbreaking innovation introduced by Perusahaan Umum Percetakan Uang Republik Indonesia (PERURI) (Ong, 2022). Serving as a replacement for conventional stamps, e-stamps are designed to verify stamp duty payments in transactions, particularly those of a legal and administrative nature (Putri et al., 2025). PERURI, a state-owned enterprise responsible for producing currency and other high-security documents, has long been entrusted with developing secure and reliable products for the nation (Pratama et al., 2023). Headquartered in South Jakarta, PERURI operates a robust infrastructure capable of producing a variety of security features, including currency, security paper, and digital security solutions. In October 2021, PERURI launched e-stamps as part of its digital product line in compliance with Government Regulation No. 86 of 2021. This innovation marked a significant leap in administrative modernization, aligning with the growing demand for faster, more secure, and accessible digital solutions. E-stamps, as regulated under the Minister of Finance Regulations No. 133 and No. 134 of 2021, are distributed through official websites and certified distributors. These platforms enable users to register, purchase, and apply e-stamps to digital documents such as PDFs (Rahajaan & Nefi, 2022).

The limitations of Indonesia's digital infrastructure became particularly visible during the 2024 CASN (civil servant) registration period, when the e-meterai system experienced heavy traffic and intermittent service disruptions. Media reports as stated by Djailani (2024) indicate that usage exceeded one million e-meterai applications per day during the peak registration window, demonstrating an intense but event-specific spike rather than a stable national adoption pattern. For many first-time or digitally inexperienced users, these system slowdowns, download failures, and authentication errors reinforced perceptions of high complexity and low reliability, ultimately hindering broader acceptance among groups with limited digital literacy (Martzoukou et al., 2020; Nikou et al., 2022).

The shift from physical to digital stamps reflects not only a response to efficiency and security needs but also a commitment to leveraging information and communication technology to enhance public service delivery (Shibambu & Ngoepe, 2025) ; (Than et al., 2024) ; (Rabuandika & Pujiriyanto, 2025) . By reducing counterfeit risks, strengthening authentication systems, and simplifying the management of official documents, e-stamps support sustainable administrative practices (Dini & Piola, 2022). However, the transition poses significant challenges, particularly for individuals accustomed to conventional stamps. Adopting digital solutions like e-stamps requires a deep understanding of their usage, data security features, and their effectiveness in meeting public needs (Afraz et al., 2021) ; (Cirus & Simonova, 2020) ; (Mayowski et al., 2018) . While sectors such as banking, e-commerce, and public services demonstrate positive trends in digital adoption, barriers such as low digital literacy remain pervasive. With Indonesia ranking among the lowest in digital literacy in ASEAN, only 62% of its population possesses basic digital skills compared to 97% in South Korea. The ongoing challenges include technical issues during peak usage periods, as evidenced by disruptions during the 2024 civil servant registration process. Reports of server crashes and application errors highlighted the limitations of existing infrastructure, exacerbating difficulties for users unfamiliar with digital tools.

Although a number of studies in Table1 have examined digital authentication and tax-related technologies, they remain limited in explaining how Indonesian users actually adapt to e-stamps in real, post-pandemic contexts. Prior research on digital signatures (e.g., Santosa et al., 2022) focused on behavioural intention during COVID-19 and did not address structural failures such as CASN-2024 system overload or disparities in digital literacy. Cross-sector studies from healthcare, taxation, and enterprise systems (Iyanna et al., 2022; Asmah et al., 2025; Saptono et al., 2023; Do et al., 2021) offer insights on technology acceptance, yet they rely on UTAUT, TRA, or IRT and do not examine DOI attributes such as complexity, compatibility, trialability, and observability in document-authentication services. None of these works incorporate issuer-side institutional insights (e.g., PERURI) nor compare user experiences across demographic groups with varying literacy levels. Consequently, the literature provides no qualitative, constructivist explanation of how everyday users negotiate usability issues, system failures, and adaptation processes when interacting with Indonesia's e-stamp ecosystem.

Table 1 Previous Study

Prior Studies	Focus / Findings	Identified Gaps Relative to This Study	Novelty of This Study
(Santosa et al., 2022)	Quantitative SEM (n = 358) based on UTAUT2, TPB, and IAM; examines intention to adopt digital signature during the pandemic period.	Focuses only on pandemic-driven intention; does not analyze post-pandemic e-stamp issues (errors, CASN overload); lacks literacy contrasts; no institutional insights; does not use DOI attributes.	Provides a post-pandemic view of e-stamp adaptation using DOI; incorporates real user experiences across literacy levels and insights from PERURI as issuer.

Prior Studies	Focus / Findings	Identified Gaps Relative to This Study	Novelty of This Study
(Iyanna et al., 2022)	Qualitative content analysis of 59 essays from UK health workers; identifies e-health adoption barriers using Innovation Resistance Theory (IRT).	Healthcare and UK context; not related to fiscal/document authentication systems; applies IRT not DOI; no demographic segmentation; lacks issuer-side evidence.	Transfers innovation-barrier reasoning to Indonesia's fiscal digitalization; uses DOI + constructivist inquiry to explain resistance and adaptation in e-stamp services.
(Asmah et al., 2025)	Mixed-methods study using UTAUT constructs (PE, EE, SI, FC, HM) to explain adoption of a digital taxpayer portal.	Focus on tax-portal compliance, not document authentication; does not cover literacy gaps or system errors; uses UTAUT not DOI; government tax portal, not e-stamp authentication.	Bridges UTAUT-based adoption insights with DOI diffusion attributes in a document-authentication context, highlighting literacy, complexity, and system failure.
(Saptono et al., 2023)	Quantitative study of 650 e-Filing and 492 e-Form users; system/service quality, convenience, and reduced compliance cost shape satisfaction and tax-compliance intention.	Focuses on tax-return systems, not e-stamp; uses behavioural-intention lens, not constructivist; does not explore authentication failures or literacy disparities; no issuer perspective.	Supports the behavioural foundations of adoption (satisfaction, convenience, complexity) and integrates them with DOI attributes to interpret e-stamp user experiences.
(Thi Hai Do et al., 2022)	SEM analysis of 435 enterprises; attitude → adoption → tax compliance based on TRA; IT-infrastructure issues hinder adoption.	Oriented to enterprise tax compliance, not e-stamp authentication; TRA-based psychological model only; no exploration of complexity, compatibility, or institutional constraints.	Complements TRA findings with DOI-based explanation of adoption, integrating perceived complexity, literacy constraints, and institutional factors (PERURI).

To analyze these issues systematically, this research employs Rogers' Diffusion of Innovation (DOI) Theory, which explains adoption behavior through five innovation attributes: relative advantage (the perceived benefits over existing methods), compatibility (alignment with user needs and practices), complexity (the perceived difficulty of use), trialability (opportunities to test the innovation), and observability (visibility of successful use). These attributes provide a comprehensive lens to examine why some digital tools diffuse rapidly while others face adoption barriers.

Given those empirical challenges, the present study aims to analyze public adaptation to e-meterai within Indonesia's broader digital transformation agenda. Specifically, this study is guided by the following research questions:

1. How do users perceive the benefits and practical value of e-stamps in supporting efficiency, security, and administrative needs in Indonesia?
2. What technological, usability, and digital literacy challenges do users encounter when adopting e-stamps, especially during high-demand periods such as CASN 2024?
3. How do user characteristics influence their adaptation processes and acceptance of e-stamps?

2. METHOD

The research utilizes a descriptive study framework to analyze the societal adaptation to e-stamps in Indonesia, focusing on the factors influencing their diffusion, adoption, and perceived challenges (Allsop et al., 2022). The research was conducted within a constructivist framework to capture the nuanced realities of individual experiences and perceptions regarding digital innovation. Data collection, analysis, and validation processes were meticulously designed to ensure comprehensive and credible findings.

2.1. Planning and Research Design

This study was conducted in Jakarta using a descriptive qualitative design situated within a constructivist paradigm. The planning stage involved defining the research objectives, identifying the conceptual alignment with Rogers' Diffusion of Innovation (DOI) framework, and setting inclusion criteria to ensure participant variation in age, occupation, and levels of digital literacy. A preliminary review of regulations, scholarly literature, and media reports informed the boundaries of inquiry and supported the development of guiding themes for data collection.

2.2. Sampling Strategy

Purposive sampling was used to obtain diverse perspectives on e-stamp usage. The primary dataset consisted of participants selected based on demographic variation and differing levels of experience with digital tools. The focus group discussion (FGD) involved five participants, comprising an entrepreneur aged 49, a private sector employee aged 35, a prospective civil servant aged 23, and two university students aged 22 and 19. These participants were chosen to represent both digitally proficient users and individuals with limited digital exposure, ensuring a balanced exploration of generational and occupational differences in e-stamp adaptation. Their demographic distribution reflects the heterogeneity necessary for interpretive depth in constructivist analysis.

2.3. Data Collection Procedures

Data were collected through two primary qualitative methods: one focus group discussion (FGD) and one institutional semi-structured interview. The FGD, conducted face-to-face in Jakarta, lasted approximately 90 minutes and generated exchanges illustrating diverse user experiences and challenges in adopting e-stamps. An in-depth interview with a representative from PERURI's Marketing Brand Management Department, lasting 45 minutes, provided organizational perspectives on system implementation, public engagement, and operational constraints. Additional secondary data were drawn from Government Regulation No. 86/2021, Minister of Finance Regulations No. 133 and 134/2021, PERURI publications, academic articles, and news reports. These sources contextualized primary data and supported triangulation.

2.4. Data Processing

Audio recordings from both the FGD and the institutional interview were transcribed verbatim, yielding approximately 36 pages of textual data. The transcripts underwent cleaning and organization in spreadsheet format to facilitate systematic comparison across participant responses. This structured dataset formed the foundation for coding and thematic construction. The preparation process ensured consistency, traceability, and clear separation between participant narratives and researcher interpretations.

2.5. Coding and Analytical Procedures

The study employed a three-stage coding approach inspired by Strauss and Corbin's grounded-theory techniques. Open coding was first used to extract initial concepts directly from the transcripts. These concepts were refined through axial coding, which organized the data around the five DOI attributes: relative advantage, compatibility, complexity, trialability, and observability. Finally, selective coding integrated these categories into overarching themes that explain how Indonesian users perceive and adapt to e-stamps. This sequential analytic procedure allowed the dataset to evolve inductively while remaining theoretically anchored to the DOI model.

2.6. Triangulation and Saturation

Credibility was strengthened through triangulation of the FGD, the institutional interview, and secondary materials. Thematic saturation was reached during analysis when no new codes emerged after the fourth FGD participant, indicating that the dataset had sufficiently captured the range of user experiences relevant to the study focus. The interview with PERURI served as an institutional counterpoint that clarified policy, operational structures, and documented challenges, thereby enhancing analytic dependability. Cross-checking among data sources ensured internal coherence and minimized interpretive bias.

2.7. Synthesis and Interpretation

The final stage synthesized coded data into coherent thematic findings linked to the DOI framework. Interpretation considered both individual experiences and structural barriers, such as digital literacy disparities, system reliability issues, and limitations in public socialization. By linking user narratives to broader institutional and regulatory contexts, the study generated a multidimensional understanding of the societal adaptation process surrounding e-stamps. This synthesis provided the basis for identifying challenges, opportunities, and actionable recommendations for accelerating digital stamp adoption in Indonesia.

3. RESULTS AND DISCUSSION

3.1. Summary of Participant Perceptions Based on DOI Attributes

The analysis of the FGD data revealed distinct patterns across the five attributes of Rogers' Diffusion of Innovation model. Most participants (80%) recognized the relative advantage of e-stamps, describing them as more efficient, time-saving, and cost-reducing compared to physical stamps. Perceptions of compatibility were moderately strong, with three participants (60%) explaining that e-stamps aligned well with their

administrative needs, particularly for employment contracts, organizational documents, and CASN registration. However, complexity emerged as a significant concern, as three participants (60%) recounted experiences with system errors, failed downloads, and difficulties navigating the platform during high-traffic periods. Limited trialability was also evident, with two participants (40%) admitting hesitation to use e-stamps due to the absence of opportunities for hands-on practice or guided demonstrations. Meanwhile, observability was relatively high, with four participants (80%) stating that their awareness of e-stamps came from workplaces, peers, or media exposure, suggesting that visibility of successful use cases played a role in shaping their perceptions. Collectively, these findings indicate that while participants broadly acknowledge the value and visibility of e-stamps, barriers related to technical complexity and limited opportunities to try the system continue to constrain wider adoption.

Table 2 Perceptions of E-Stamp Adoption Based on DOI Attributes (n = 5)

DOI Attribute	Indicative Perception from FGD	n	%
Relative Advantage	Mentioned saving time/cost; perceived as more practical.	4	80%
Compatibility	Used for contracts, CASN documents, and organizational needs.	3	60%
Complexity	Reported system errors, download failures, and confusion about the process.	3	60%
Trialability	Had never tried it; hesitant to use it for important documents.	2	40%
Observability	Noticed others using it; learned about it through workplace or media.	4	80%

3.2. Results

In the transition from conventional stamps to digital e-stamps, this innovation represents a response to the growing need for efficiency and security in transactions. The process involves diffusion and adoption, as explained by Rogers in the Diffusion of Innovation (DOI) theory, which outlines three main concepts: innovation, diffusion, and adoption (Shaikh & Amin, 2025) ; (Zahroh et al., 2025) ; (Almariski & Yazid, 2024). To achieve successful adoption, further elaborated regarding five element indicators of creation: relative advantage, compatibility, complexity, trialability, and observability. Despite its potential benefits, the adoption of e-stamps in Indonesia faces significant challenges, particularly due to the country's low level of digital literacy. According to available data, only 62% of Indonesians possess basic digital skills, compared to 97% in South Korea. Director common of Computing Apps at Kominfo, Semuel Abrijani Pangerapan, noted that Indonesia's digital literacy index stands at an average score of 3.54 out of 5, covering perspectives like since tech abilities, onlice security, internet habits, plus digital ethics (Sirait et al., 2024)

This lack of digital literacy presents a considerable obstacle for PERURI in achieving widespread adoption of e-stamps. Field reports highlight several practical challenges related to e-stamps, reflecting the digital literacy gap among Indonesians. Issues frequently encountered by users include incorrect placement of e-stamps, repeated usage of the same stamp, and errors in application that follow conventional methods, often rendering documents invalid (Halo Jember, 2024). These challenges align with the data on Indonesia's limited digital capabilities and underscore the need for robust education and support systems.

Diffusion, as defined by Rogers (1983) in (Afraz et al., 2021) ; (Mayowski et al., 2018), signifies a steps of interacting about technological breakthrough using specific platform mediums gradually to any participants society framework. This idea is supported by Suciati (2017), who argued that the spread of innovation involves a structured communication process. Similarly, Aida et al. (2016) likened diffusion to Barlo's communication model (SMRC), which includes a source, message, channel, receiver, and effect (Wibowo, 2019). In this context, e-stamps represent a novel approach designed to address the inefficiencies and risks associated with conventional stamps. However, the process of diffusion and adoption in Indonesia requires overcoming significant barriers, especially those rooted in the complexity of the technology and limited opportunities for trial and error. Addressing these challenges will be essential for achieving broader acceptance and maximizing the benefits of e-stamps for society.

Dispersion be step about engaging an advancement via specific communication avenues during a defined term to all constituents of a social network (Rogers, 1983) in (Afraz et al., 2021) ; (Mayowski et al., 2018). In the context of e-stamps, PERURI has actively engaged in the diffusion process to penetrate the national market. This process encompasses marketing, education, digital literacy campaigns, and public outreach efforts. PERURI employs multiple channels, comprising its official website, digital platforms, plus online TV, to communicate the utility and availability of e-stamps to the broader community. Aligned with Suciati's (2017) perspective, the diffusion of an innovation requires structured communication processes to ensure effective dissemination. PERURI has embraced this approach by using various media to inform and educate the public about e-stamps' introduction, benefits, functions, and usage.

For instance, a feature broadcasted on Kompas TV (2021) highlighted the differences between electronic and physical stamps while explaining where and how to purchase e-stamps and their practical application. Such initiatives aim to raise public awareness and facilitate a smoother transition to digital stamps. The diffusion process also reflects the communication model proposed by Barlo, known as SMRC (Source, Message, Channel, Receiver, and Effect), as discussed by Aida et al. (2016) and Wibowo (2019). PERURI acts as the source, disseminating messages about e-stamps through various channels, including its website, official social media accounts, and promotional materials. Among these, social media has emerged as a vital tool for reaching audiences. PERURI's Instagram account (@peruri.digital), with over 99,700 followers, serves as a platform for raising awareness, sharing educational content, and promoting its digital products. PERURI also employs storytelling, webinars, tips, games, and other interactive content to maintain audience engagement and foster a better understanding of e-stamps.

Insights gathered through focus group discussions (FGDs) revealed diverse perspectives and experiences related to e-stamp usage in Indonesia. The findings indicate varying levels of understanding and acceptance among different societal segments. Respondents in the FGD fell into two primary categories: those who had already used e-stamps for administrative or legal documentation and those who were aware of e-stamps but had no direct experience using them. This disparity highlights the need for targeted educational efforts to address gaps in knowledge and ensure broader adoption.

Next, the following are excerpts from FGD participants regarding their perspectives and experiences with e-stamps:

> *"Sebagai calon CASN yang baru-baru ini menggunakan e-meterai untuk dokumen-dokumen yang harus ditandatangani saat proses pendaftaran saya." ("As a prospective civil servant applicant (CASN) who recently used e-stamps for documents that needed to be signed during the registration process.") (Nuril Ali, FGD Participant, 2024)"*

"Saya tahu tentang e-meterai dari kantor, karena saya baru-baru ini mulai menggunakannya untuk keperluan dokumen-dokumen penting untuk kontrak kerja dan surat perjanjian." ("I learned about e-stamps from my workplace, as I recently started using them for important documents, such as work contracts and agreements.") (Joerdy Vanegadani, FGD Participant, 2024)

> *"Sejujurnya saya belum pernah menggunakan e-meterai untuk keperluan kantor saya."*
> ("Honestly, I have never used e-stamps for my office needs.") (Dey Ricci Aryanti, FGD Participant, 2024)

Based on these FGD excerpts, two of the three participants have used e-stamps for administrative purposes, such as work contracts, agreements, and registration for the 2024 CASN. However, one participant has yet to use e-stamps for professional needs. This aligns with Rogers' (1983) Diffusion of Innovation theory, which states that adoption occurs when individuals actively utilize an innovation in real-life practices as an optimal solution. It is evident that the adoption of e-stamps in daily needs has begun, especially in professional and formal environments where document authenticity and security are crucial.

"*Saya tahu tentang e-meterai, saya juga pernah menggunakannya untuk keperluan organisasi saya*." ("I know about e-stamps, and I have used them for my organization's needs.") (Geubrina, FGD Participant, 2024)

> "*Saya setuju dengan pendapat sebelumnya bahwa e-meterai itu lebih praktis. Walaupun saya juga belum pernah menggunakannya*." ("I agree with the previous opinion that e-stamps are more practical, although I have not used them myself.") (Tasya, FGD Participant, 2024) From those responses, the researcher observed that both student participants recognized the practicality of e-stamps, although only one had used them for organizational activities. The other participant acknowledged the benefits but had no direct need or experience to use e-stamps. This indicates that the adoption of e-stamps is influenced by specific needs within certain groups. However, the benefits and practical applications of e-stamps have successfully educated and raised awareness, even among those who have not yet used them.

The transition from physical to digital stamps introduces new technical applications that elicit varied reactions from different societal groups. As part of this study, the researcher analyzed how individuals adapt to and perceive the benefits of e-stamps, capturing diverse viewpoints through FGD sessions.

> *"Menurut saya sepertinya dengan adanya e-meterai memberikan keuntungan lebih. Akan bisa hemat dari sisi waktu, e-meterai juga mengurangi biaya operasional karena tidak perlu membeli meterai fisik ya? Soal keamanan, untuk sekelas perusahaan e-meterai lebih terjamin karena ada verifikasi digital. Tapi, bagi generasi yang sudah terbiasa dengan meterai fisik, mungkin butuh waktu untuk terbiasa menggunakannya."* ("I think the introduction of e-stamps provides greater benefits. It saves time and reduces operational costs as there's no need to purchase physical stamps, right? Regarding security, for corporations, e-stamps are more reliable due to digital verification. However, for

generations accustomed to physical stamps, it might take time to get used to them.") (Dey Ricci Aryanti, FGD Participant, 2024).

This statement highlights the perceived advantages of e-stamps, particularly in terms of efficiency and cost savings, as they are accessible anytime and anywhere. Additionally, the security provided by digital verification makes e-stamps more practical and safer, especially for corporate use. However, for older generations accustomed to physical stamps, the transition may require more time and support due to familiarity with traditional methods. This indicates potential resistance among senior users who lack digital literacy, necessitating targeted education and socialization to encourage adoption.

Another participant echoed similar sentiments:

"*Keuntungannya jelas, terutama dari segi efisiensi. Dengan e-meterai, kita bisa mengurus dokumen di mana saja tanpa harus bertemu tatap muka. Ini sangat mendukung pekerjaan jarak jauh. Namun, saya berharap ada dukungan teknis yang lebih baik untuk mengatasi masalah-masalah kecil yang kadang muncul*." ("The benefits are clear, especially in terms of efficiency. With e-stamps, we can process documents anywhere without needing face-to-face meetings. This greatly supports remote work. However, I hope there will be better technical support to address minor issues that occasionally arise.") (Joerdy Vanegadani, FGD Participant, 2024).

While e-stamps are praised for their practicality, technical challenges remain a significant barrier. Participants reported issues such as failed downloads and system errors, often caused by unstable internet connections or high traffic during peak periods. "*Ya, saya pernah mengalami kendala teknis ketika e-meterai gagal diunduh atau ketika sistem mengalami error, apalagi saat jaringan internet tidak stabil. Ini bisa cukup mengganggu, terutama jika dokumen harus segera diproses*." ("Yes, I have experienced technical issues when e-stamps failed to download or when the system encountered errors, especially when the internet connection was unstable. This can be quite disruptive, especially when documents need to be processed urgently.") (Joerdy Vanegadani, FGD Participant, 2024).

"Seperti yang saya sampaikan tadi saya juga mengalami kendala dalam pengunduhan e-meterai, tapi mungkin hal itu disebabkan karena penuhnya load dalam mengakses e-meterai saat pendaftaran CASN 2024." ("As I mentioned earlier, I also faced issues downloading e-stamps, but perhaps it was due to heavy traffic accessing the e-stamp system during the 2024 CASN registration.") (Nuril Ali, FGD Participant, 2024).

According to reports from Detik.com (Yulianti, 2024) and FGD findings, technical problems such as system errors and high server loads during CASN 2024 registration created significant barriers for users who required timely document processing. These challenges highlight the need for robust technical support to ensure reliable and seamless e-stamp access.

Adoption of e-stamps also reflects generational differences. Older individuals, accustomed to physical stamps, are less likely to embrace the digital transition due to established habits, limited digital skills, and insufficient education about e-stamps' advantages.

"Mengurangi biaya operasional karena tidak perlu membeli meterai fisik ya? Soal keamanan, untuk sekelas perusahaan e-meterai lebih terjamin karena ada verifikasi digital. Tapi, bagi generasi yang sudah terbiasa dengan meterai fisik, mungkin butuh waktu untuk terbiasa menggunakannya." ("It reduces operational costs as there's no need to buy physical stamps, right? Regarding security, for corporations, e-stamps are more reliable due to digital verification. However, for generations accustomed to physical stamps, it might take time to adapt.") (Dey Ricci Aryanti, FGD Participant, 2024).

This perspective underscores the importance of targeted education and user-friendly platforms to address generational resistance and enhance adoption. By improving accessibility and awareness, the shift toward e-stamps can become more inclusive and widely accepted across all demographics.

The transition to e-stamps has sparked varied opinions, with many acknowledging both the challenges and opportunities it presents. The participants in the FGD shared their perspectives on how societal adaptation to e-stamps could be enhanced through consistent outreach and support.

"*Saya pikir, masyarakat mungkin masih cenderung memilih meterai fisik sih ya terutama generasi yang lebih tua. Namun, jika ada sosialisasi yang konsisten, misalnya di media sosial atau media konvensional, pasti adaptasi akan lebih mudah. Pemerintah juga perlu memastikan bahwa biaya e-meterai terjangkau apalagi untuk mahasiswa*." ("I think people might still prefer physical stamps, especially the older generation. However, with consistent outreach, for example, through social media or conventional media, adaptation will definitely be easier. The government should also ensure that e-stamps are affordable, especially for students.") (Geubrina, FGD Participant, 2024).

Geubrina's statement reinforces the notion that older generations are likely to stick to physical stamps due to habit. However, she expressed optimism that consistent outreach, via both digital and traditional

platforms, could ease the transition. She also emphasized the importance of affordability, particularly for younger demographics such as students, to encourage broader adoption.

Positive feedback on the digitalization of stamps was evident across other participants' responses as well:

> *"Saya melihat masa depan digitalisasi meterai ini sangat positif, terutama dalam hal efisiensi dan keamanan. Saya berharap Peruri terus mengembangkan sistem agar semakin aman dan mudah diakses, serta meningkatkan sosialisasi untuk masyarakat luas."* ("I see the future of stamp digitalization as very positive, especially in terms of efficiency and security. I hope PERURI continues to enhance the system to make it safer and more accessible, and to increase outreach to the wider public.") (Dey Ricci Aryanti, FGD Participant, 2024).

"Digitalisasi meterai ini menurut saya adalah langkah penting menuju kemudahan administrasi di berbagai sektor. Pemerintah bisa membantu dengan memberikan pelatihan dan support system agar masyarakat bisa mengatasi kendala teknis dengan cepat." ("I think the digitalization of stamps is a significant step towards administrative convenience across various sectors. The government could assist by providing training and a support system to help people address technical issues quickly.") (Joerdy Vanegadani, FGD Participant, 2024).

> *"Sebagai pengguna, saya sangat mendukung digitalisasi ini dan melihatnya sebagai masa depan yang ideal untuk administrasi. Sosialisasi yang lebih intens dan edukasi mengenai legalitas e-meterai sangat penting agar semua pihak percaya dan siap menggunakannya."* ("As a user, I fully support this digitalization and see it as the ideal future for administration. More intensive outreach and education on the legal status of e-stamps are crucial to ensure trust and readiness among all parties.") (Nuril Ali, FGD Participant, 2024).

Overall, the FGD participants expressed optimism about the future of e-stamp digitalization in Indonesia. Many recognized its potential to improve the efficiency and security of document handling. They also highlighted key areas for improvement, including system accessibility, technical support, and public education about the legal standing of e-stamps. The participants collectively suggested that PERURI and the government focus on enhancing public outreach, stabilizing technical infrastructure, and providing comprehensive support to ensure a seamless user experience. Moreover, as digitalization continues, targeted training programs and affordable access should be prioritized to foster widespread adoption (Pawirosumarto 2025).

Therefore, based on the researcher's analysis of FGD results and linked to Rogers' DOI concept, five essential characteristics a advancement performance edge, suitability, difficulty, testability, plus visibility (Rogers, 1983) as in (Cirus & Simonova, 2020) ; (Mandal, 2019) were explored as follows.

3.3. Discussion

3.3.1. Relative Advantage

The participants in the FGD highlighted the clear advantages of e-stamps compared to physical stamps, emphasizing efficiency and security. Many participants recognized that e-stamps save time and reduce operational costs, as they eliminate the need to purchase and manage physical stamps. Additionally, the digital verification process provided by e-stamps offers a higher level of security, particularly for corporations and formal institutions that prioritize the authenticity of legal documents. However, the discussion also revealed that older generations, who are accustomed to traditional physical stamps, might need additional support and time to adapt to the new system. This generational gap underscores the importance of targeted efforts to make e-stamps accessible and acceptable to all demographic groups. E-stamps' ability to streamline administrative processes while maintaining security makes them an attractive solution for professionals and remote workers who rely on efficient, digital workflows (Cirus & Simonova, 2020) ; (Mandal, 2019) ; (Mayowski et al., 2018) ; (Salazar et al., 2020).

3.3.2. Compatibility

The compatibility of e-stamps with professional and administrative needs was evident in the FGD discussions. Participants shared positive experiences of using e-stamps for various formal purposes, such as work contracts and CASN registration. These examples illustrate that e-stamps align well with the requirements of modern administrative processes, particularly in formal and professional settings. However, some participants pointed out the challenges faced by older generations, who might hesitate to adopt e-stamps due to long-standing habits and limited digital literacy. This highlights the need for consistent outreach and education to bridge the gap between different societal groups. Ensuring compatibility across diverse demographics is crucial for achieving broader adoption of e-stamps in Indonesia (Cirus & Simonova, 2020) ; (Mandal, 2019) ; (Mayowski et al., 2018) ; (Salazar et al., 2020).

3.3.3. Complexity

Complexity emerged as a significant barrier to the adoption of e-stamps. Technical challenges, such as download failures and system errors, were frequently mentioned by participants, particularly during peak

usage periods like CASN registration. These issues highlight the need for improved system infrastructure and technical support to make e-stamps more user-friendly and reliable. For many users, especially those unfamiliar with digital tools, the perceived complexity of e-stamps can discourage adoption. Simplifying the user interface and addressing common technical problems will be key to overcoming these challenges and fostering greater confidence in the system (Cirus & Simonova, 2020) ; (Mandal, 2019) ; (Mayowski et al., 2018) ; (Salazar et al., 2020).

3.3.4. Trialability

The limited trialability of e-stamps was another obstacle noted in the discussions. Participants expressed the need for more opportunities to experiment with e-stamps before using them for critical tasks. For example, those who have not yet used e-stamps acknowledged their potential benefits but hesitated due to a lack of firsthand experience. Providing users with a risk-free environment to try e-stamps, such as through demonstrations, tutorials, or guided practice sessions, could significantly improve their confidence and willingness to adopt this innovation. Trialability is particularly important for new users who are less familiar with digital solutions (Cirus & Simonova, 2020) ; (Mandal, 2019) ; (Mayowski et al., 2018) ; (Salazar et al., 2020).

3.3.5. Observability

Observability, or the ability to perceive the tangible benefits of e-stamps, performs an key function inside encouraging adoption. Participants emphasized the importance of showcasing the real-world applications of e-stamps, such as their effectiveness in streamlining administrative tasks and enhancing security. Positive testimonials and examples of successful e-stamp usage can build trust and demonstrate the practical advantages of this innovation. Additionally, educating the public about the legal status and broader implications of e-stamps in administrative processes can help address doubts and foster greater acceptance. By increasing observability through targeted education and outreach, the diffusion of e-stamps can be accelerated (Cirus & Simonova, 2020) ; (Mandal, 2019) ; (Mayowski et al., 2018); (Salazar et al., 2020).

The dissemination of PERURI's e-stamp invention is mostly consistent with Rogers' Diffusion of invention hypothesis (Ong, 2022). This study effectively analyzed the creation, dissemination, and acceptance phases of e-stamps in Indonesia, revealing both problems and potential to improve administrative efficiency moving forward. The investigation indicates that e-stamps offer considerable advantages for efficiency, security, and convenience. E-stamps serve as a contemporary solution, notably catering to the requirements of formal sectors such as government and business, by providing secure digital certification and expedited application procedures. Furthermore, e-stamps correspond with Indonesia's extensive digital transformation initiatives, mirroring the global transition towards electronic document management in recent years. This illustrates the capacity of e-stamps to become a fundamental element of the nation's digital infrastructure. Nonetheless, substantial hurdles persist, especially regarding technological complexity and Indonesia's low digital literacy rate, which impede the comprehensive and successful deployment of e-stamps (Sirait et al., 2024).

A significant segment of the Indonesian populace continues to encounter difficulties and inaccuracies while utilizing e-stamps (Artanto, 2024); (Ghahfarokhi, 2025); (Djatmiko et al., 2025) especially among individuals lacking familiarity with digital technology or access to sufficient digital gadgets. Furthermore, restricted options for experimentation and insufficient direct experience with e-stamps persist in hindering wider acceptance.

The public's awareness of the concrete advantages of e-stamps is low, underscoring the necessity for comprehensive education and outreach initiatives (Abbas & Putra, 2024); Agnesia et al., 2024). According to PERURI's interviews, the corporation is dedicated to advancing digital goods and assuring the cost and accessibility of e-stamps via its official channels, while there is potential for enhancement. PERURI has undertaken initiatives to enhance public awareness via diverse media partnerships and outreach endeavors. The shift to e-stamps has encountered technological difficulties, especially during peak demand periods such as the CASN 2024 registration. The firm is dedicated to system improvements and platform expansions to guarantee an enhanced customer experience in the future (Sulistyawati & Munawir, 2024).

4. CONCLUSION

This study examined public adaptation to e-stamps through three guiding research questions. For Research Question 1 (How do users perceive the benefits and practical value of e-stamps?), the findings show that most participants acknowledged clear advantages related to efficiency, convenience, and security, particularly in formal administrative contexts such as employment contracts and CASN documentation. These perceived benefits demonstrate that e-stamps hold strong relative advantage and compatibility for digitally accustomed users. For Research Question 2 (What technological, usability, and digital literacy challenges do users encounter during adoption?), the results indicate that complexity remains the dominant barrier. Participants reported system errors, failed downloads, and difficulties navigating the platform—issues that

intensified during the CASN 2024 peak usage period. Limited trialability and uneven digital literacy, especially among older and less digitally experienced groups, further constrained adoption. These barriers reflect structural weaknesses in both user support and system readiness. For Research Question 3 (How do user characteristics influence adaptation and acceptance?), the data reveal clear demographic patterns. Younger participants and those with prior exposure to digital administrative tools adapted more quickly and expressed greater confidence in e-stamps. In contrast, older users and individuals with lower digital literacy displayed stronger hesitation and required more guidance, illustrating the social and generational dimensions of digital transition.

Based on these findings, several strategic recommendations emerge. PERURI could introduce an augmented-reality (AR)-based tutorial application to guide users step-by-step through e-stamp purchase, placement, and verification. Community-level dissemination could be strengthened through RT/RW digital literacy campaigns, targeting older and low-literacy populations. To widen institutional impact, PERURI may formalize collaboration through an MoU with the Ministry of Communication and Information Technology (Kominfo) aimed at achieving a 20% improvement in targeted digital literacy indicators, supported by structured training programs, integrated helpdesk systems, and multilingual user guides. Additionally, enhancing technical infrastructure to prevent peak-period system overload and expanding trialability through sandbox environments would substantially improve user experience. Future studies may investigate long-term behavioral adaptation, compare adoption patterns across regions, and explore integration of e-stamps within broader digital governance ecosystems such as national digital identity, electronic signatures, and interoperable public service platforms.

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