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Transforming Democracy : An Analysis of the SIDALIH System's on Voter Data Management Indonesia

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Abstract: The management of voter data in Indonesia's elections has faced significant challenges, such as data inaccuracies, duplication, and manual errors in data updating. To address these issues, the General Election Commission (KPU) initiated the digital transformation of voter data management by implementing the SIDALIH (Voter Data System) since 2009. This study aims to analyze the Sidalih system's impact on voter data management in Indonesia. This study uses a qualitative method with a case study approach to analyze the impact of SIDALIH's implementation. Data sources were obtained through in-depth interviews with key stakeholders in KPU, Bawaslu, and other government institutions, as well as direct observations of the SIDALIH system's implementation. The results show that SIDALIH has introduced several innovations in voter data management. The initial digitalization allows for more efficient voter registration and data updating. Integration and automation have been introduced by connecting SIDALIH with other systems such as Silog and Sirekap, which enhances the speed and accuracy of data processing. Additionally, optimization and improvements in system security have been made to ensure data security and better interoperability across platforms. The factors influencing the success of this transformation include technological factors, such as challenges in digital infrastructure and the need to strengthen data security. Organizational factors, including the preparedness of human resources (HR) and organizational resistance to change, also play a significant role. Furthermore, policy and regulatory factors, including the need for clear regulatory support, are crucial to ensuring the sustainability of the digital transformation.

Keywords: *digital transformation, SIDALIH, voter data management, Indonesian elections.*

INTRODUCTION

The *Sidalih* system, an acronym for *Sistem Data Pemilih Berbasis Teknologi Informasi* (electoral data system based on information technology), represents a fundamental innovation in the management of electoral data in Indonesia. This digitized platform emerged from a recognized necessity to improve the recording of voters and reduce the inefficiencies that have afflicted electoral processes in the past, particularly through manual data collection techniques. By exploiting technology to simplify the management of voters' data, *Sidalih* not only modernizes the electoral landscape, but also aims to improve the overall integrity and accessibility of the electoral process.

The significance of *Sidalih* in the electoral arena is underscored by its ability to adapt to the demands of contemporary governance, in which transparency, accuracy, and efficiency are fundamental. In a country characterized by its vast population and diversified geographical landscape, traditional methods of recording voters have often been fraught with challenges, including data inaccuracy, duplication of registrants, and difficulties in reaching rural polling stations. The introduction of the *Sidalih* system marks a departure from these conventional practices, as it allows real-time updates and database management that improve the quality of voter information and facilitate data accessibility between various electoral bodies. This transformation aligns with global trends emphasizing the importance of digitization in public administration, thus positioning Indonesia within a broader context of governance reform.

Furthermore, the implementation of *Sidalih* is a crucial step toward achieving an inclusive electoral landscape. By leveraging technology, the system enables broader participation and

involvement from various demographic segments, including marginalized groups. The digitization of voter data not only ensures the integrity of the electoral process, but also empowers citizens with timely and accurate information about their voting rights. Through advanced data management practices, the *Sidalih* system plays a significant role in promoting public trust in electoral mechanisms, which is essential for democratic legitimacy.

However, while *Sidalih* offers numerous advantages, its deployment is not without challenges. The digital divide in Indonesia presents significant obstacles, as not all citizens have equal access to the necessary technology or internet connectivity required for effective participation in the electoral process. Additionally, the implementation of any digital system requires robust infrastructure and ongoing training for the stakeholders involved, including electoral officials, local governments, and the electorate. Therefore, despite the innovations brought by *Sidalih*, the need for comprehensive strategies to bridge these gaps remains a predominant concern.

Addressing the challenges associated with the *Sidalih* system requires targeted interventions. Recommendations to further improve the management of voter data through *Sidalih* include the development of hybrid systems that integrate digital and traditional approaches to accommodate diverse populations. Expanding public awareness campaigns about the *Sidalih* system and its functionalities can also support participation, ensuring that citizens are informed and engaged in the electoral process. Moreover, investing in infrastructure improvements and expanding internet access in remote areas will be crucial to leveling the playing field, enabling all individuals to benefit from advancements in modern voter data management.

Ultimately, while the *Sidalih* system represents a transformative tool in enhancing the recording of voters and data management in Indonesia, its success depends on recognizing and addressing the multifaceted challenges that accompany the digital transformation of electoral processes. By embracing both technological innovation and inclusive practices, Indonesia can move toward a more robust and equitable electoral landscape.

The introduction of the *Sidalih* system (*Sistem Data Pemilih dan Pemungutan Suara*) has marked a significant transformation in how voter data is managed in Indonesia, particularly regarding the simplification of voter registration and the improvement of data management processes. As articulated by Khatami and Rahayu (2023), the system encapsulates a series of innovative characteristics aimed at improving the accuracy and efficiency of voter data management.

One of the main innovations of the *Sidalih* system lies in its digitization of the voter registration process. Previously characterized by cumbersome manual procedures, the voter registration landscape in Indonesia faced challenges such as data inaccuracies, duplications, and time constraints. The implementation of *Sidalih* facilitates an electronic registration platform that allows citizens to register online. This innovation not only promotes greater accessibility for potential voters, particularly in remote areas, but also accelerates the data collection process. By allowing users to enter their personal information digitally, the system reduces the probability of human error that often occurs in manual databases.

In addition, *Sidalih*'s integration with other government databases represents significant progress in the interoperability of voter data management. By connecting with databases from various government agencies, the system improves the process of verifying citizens' identities against existing records. This cross-referencing capability addresses a fundamental need for data integrity, enabling electoral officials to validate voter information with greater precision and reduce instances of electoral fraud. Khatami and Rahayu (2023) note that this integration not only strengthens security measures but also promotes transparency in the electoral process, fostering public trust.

The *Sidalih* system also incorporates real-time data updating features, allowing electoral officials to maintain an accurate and current electoral register. This responsiveness is vital, as it enables updates in response to various life events such as changes in residence, civil status, or the eligibility of new voters, ensuring that the data remains reflective of the population. The ability to access and modify information in real time significantly enhances the capacity of electoral institutions to make informed decisions and implement timely interventions when necessary.

Another noteworthy innovation within the *Sidalih* framework is its advanced data analysis capability, which allows for the systematic examination of voter data trends. By leveraging analytical tools, electoral authorities can gain insights into demographic behavior, voter engagement activities, and turnout patterns. This capability not only aids in strategic planning for future elections but also supports targeted awareness programs to ensure greater voter participation, especially in underrepresented communities. Khatami and Rahayu (2023) emphasize that such analyses provide a foundation for evidence-based initiatives aimed at increasing voter turnout and engagement.

Despite these innovations, challenges remain in fully realizing *Sidalih*'s potential. Issues related to digital literacy among populations, infrastructure inconsistencies, and cybersecurity threats pose significant obstacles to the system's effectiveness. Addressing these multifaceted challenges will be necessary to optimize the benefits of the innovations introduced by the *Sidalih* system, highlighting the need for sustained commitments to digital literacy programs, infrastructure investments, and robust IT security measures.

The implementation of the *Sistem Pemilih* (*Sidalih*) database in Indonesia marks an important turning point in the landscape of voter data management, emphasizing the role of digital systems in improving electoral processes. Essentially, *Sidalih* aims to streamline the management of voter registers, thereby promoting more efficient, transparent, and fair electoral participation. The innovations introduced through *Sidalih* contribute positively to the integrity and accessibility of voter data, but they also present various challenges that require careful analysis.

Innovatively, *Sidalih* uses a centralized database approach, consolidating information from disparate voter registration sources into a single accessible platform. This integration allows electoral authorities to maintain precise and up-to-date registers of eligible voters, thereby reducing cases of double registration and electoral fraud. The system employs technology to automate registration processes, minimizing manual intervention and the potential for human error. Additionally, *Sidalih* supports real-time updates, enabling voters to check their status and ensuring that demographic changes are promptly reflected in the voter register.

Despite this progress, the *Sidalih* system faces multiple challenges that hinder its optimal functionality. First, digital literacy poses a significant barrier, particularly in rural areas where traditional practices prevail and access to technological resources is limited. Many voters may lack the skills necessary to navigate digital platforms, potentially disadvantaging those unfamiliar with the system. Additionally, the digital divide exacerbates existing inequalities, as individuals in urban centers have easier access to voter information compared to their rural counterparts.

Data security is another critical concern. Given the sensitivity of voter information, the risk of cyberattacks or data breaches can erode public confidence in the electoral system. As evidenced by several high-profile cyber incidents globally, safeguarding voter data from malicious actors requires robust security protocols and continuous monitoring, which can strain the resources of electoral management organizations in Indonesia.

Furthermore, the transition to *Sidalih* has revealed issues related to bureaucratic inertia and resistance to change within electoral institutions. Moving from traditional voting frameworks to a

digitized approach requires a cultural transformation, which can be met with skepticism from officials accustomed to conventional methods. Limitations in human resource capacity and insufficient training programs hinder the efficiency of personnel managing the new system, impacting the overall execution of voter data management.

To address these challenges, several recommendations can be made. Foremost, improving digital literacy should be prioritized through extensive public education campaigns aimed at familiarizing voters with the *Sidalih* system. Collaborations with local community organizations are essential to reach marginalized populations, ensuring that all voters are equipped to utilize available technological resources.

Previous studies have significantly contributed to understanding the *Sidalih* system and its impact on electoral data management in Indonesia. The first study by Khatami and Rahayu (2023) explored advancements in digitizing voter registration processes with the *Sidalih* system, highlighting its positive contributions to improving data accuracy, reducing errors, and enhancing voter accessibility. However, Khatami and Rahayu's research primarily focuses on the technical innovations of the system and its integration with other government databases, without addressing the broader socio-political challenges that might hinder the successful implementation of *Sidalih*, particularly in rural and underserved areas. This gap in addressing digital literacy, infrastructure limitations, and resistance to change among electoral authorities leaves a critical aspect of system implementation unexplored.

Another relevant study by Sutrisno and Prasetyo (2022) focuses on public perception of the *Sidalih* system, particularly in terms of trust and security concerns. The study found that while the majority of voters in urban areas were enthusiastic about the system, significant concerns persisted in rural regions regarding accessibility and data security. This study highlighted the importance of addressing these concerns through better training and public awareness campaigns. However, Sutrisno and Prasetyo's research overlooks the technical challenges related to system integration, such as real-time data updates and cross-referencing with other government databases, which are fundamental to ensuring the integrity of the electoral process.

The purpose of this study is to critically analyze the *Sidalih* system's impact on voter data management in Indonesia, exploring its benefits, challenges, and the socio-political barriers hindering its full implementation. The benefits of this study include offering recommendations for improving public education campaigns, enhancing digital infrastructure in rural areas, and ensuring robust data security protocols.

MATERIALS AND METHODS

This research uses a qualitative method with a case study approach. Case studies were chosen because this approach allows researchers to conduct in-depth analysis of phenomena that occur in a particular context, namely the transformation of election data management through the application of information and communication technology (*ICT*). The case study approach allows researchers to focus on one or several cases that are relevant to the topic under study and to further explore the practices, policies, and challenges faced by the organization in implementing the transformation.

Case studies are well suited to answering research questions relating to “how” and “why” a phenomenon occurs, and provide in-depth insights into the dynamics that influence the transformation process. In the context of this research, the main focus is to understand how *EMB* organizations, such as *KPU*, *Bawaslu*, and *DKPP*, implement technology-based election data management systems and how the transformation process takes place within these organizations.

The case study method was chosen because this research aims to explore and analyze in detail the transformation process in election data management, especially in the context of the application of information and communication technology. This research includes an analysis of several election management institutions in Indonesia, such as the *KPU*, *Bawaslu*, and *DKPP*, which use the *Sidalih* (Voter Data System) system to manage election data. The case studies provide an opportunity to analyze how existing policies, systems, and practices within these institutions interact with each other and impact the implementation of digital transformation in election data management.

Data analysis will follow a thematic analysis approach, where patterns and themes will be identified from the interview transcripts, field notes, and documents. Thematic analysis allows for the identification of recurring ideas and issues related to the implementation of *ICT* in election data management. The data will be coded into categories, and key themes will emerge, providing insight into the challenges and successes of the transformation process.

RESULTS AND DISCUSSION

The research focus that has been determined in this study is intended to provide research boundaries by selecting relevant data in this research study. Consideration of the research focus is also based on the limitations of time, cost, and researcher energy in preparing this research. The focus of the research is also intended to make researchers more focused in conducting research on the transformation of voter data management in general elections in Indonesia with an ICT base.

The transformation of voter data in general elections with an ICT base uses the concept of transformation put forward by (Beson and Rowe 2012) which includes the transformation of the administration of elections in Indonesia which is studied through two main perspectives, namely the macro level (the EMB organization) and the micro level (the inner workings of each EMB unit). This study aims to analyze the elements of the transformation process and identify its impact on the efficiency, transparency and accuracy of the conduct of elections. The main focus of this research includes several sub-components that have been discussed as follows:

Environmental Context and Organizational Context of the EMB

This research has discussed the environmental and organizational contexts of EMBs. In this section, researchers have examined the external factors that influence the transformation process of the EMB, such as government policies, regulations, and socio-political dynamics. We have also identified the economic conditions, infrastructure and technological aspects that form the basis for the application of information and communication technology (ICT) in election data management. In addition, researchers also investigated the organizational context in EMBs such as KPU, Bawaslu and DKPP, and how the organizational structure, work culture and the role of each unit in these institutions support or even become obstacles in the implementation of digital transformation. This is done to understand the extent to which the organizational context affects the implementation of technology in election data management.

Agenda for Transformation of Election Management

In this study, researchers have identified the election transformation agenda that has been carried out in Indonesia. Researchers analyzed the policies and transformation programs that have been implemented by the EMB, including the implementation of the Sidalih (Voter Data System) system. This transformation agenda aims to improve accuracy, transparency and efficiency in updating

voter data as well as the organization of elections as a whole. Researchers have also explored the goals and expectations set out in the transformation agenda, and how technology supports the achievement of these goals. The efforts made by the KPU, Bawaslu and other related institutions in making this transformation a success have been the main focus of this research.

The Impact of the Transformation Agenda on Election Management Transformation Activities

Furthermore, this study has evaluated the impact of the transformation agenda on the transformation activities of organizing elections. The researcher analyzed how the application of information technology has impacted the quality of voter data, as well as changes in the conduct of elections that are more digitally based. The research reveals that the application of ICT in election data management has had a significant impact, both in terms of increased efficiency and transparency and in terms of the accuracy of voter data. Researchers have also explored changes in the way EMBs work, including the process of updating voter data, verifying data and preparing the permanent voters list (DPT) through digital-based systems.

Transformation Activities Viewed from the Support of Digital Technology

This research has also analyzed the transformation activities seen from the support of digital technology in election data management. Researchers identified the various types of technology used in the activities of updating voter data, verifying data, and preparing DPT, and how these technologies support the transformation process in organizing elections. In this case, we examined how the organizational value of EMBs has been affected by the application of technology. Changes in internal policies, work procedures and training provided to EMB staff to support the use of digital technologies have been part of this study. The research shows that the use of digital technology in EMBs requires adjustments to organizational values that include changes in work culture and increased technological capacity.

Challenges and efforts to overcome obstacles from Indonesia's EMB Transformation Activities

In this section, we have examined the disruptions and reconciliations that occurred during the electoral management transformation process in Indonesia. We found that during the implementation of technology in electoral data management, a number of technical glitches and infrastructure constraints arose, especially in remote areas that had limitations in terms of internet networks and the necessary hardware. Researchers also explored how EMBs reconciled or attempted to resolve problems that occurred during the transformation process.

Measures taken to address these issues have been identified, such as improvements to technological infrastructure, staff training and changes in policy to support the smooth running of the digital transformation process. This is an important focus in this research to ensure that digital transformation can take place smoothly and have a positive impact on the performance of election administration.

At the heart of Sidealih's innovative framework is its ability to integrate data from several sources, thereby minimizing the impact of double recordings and inaccuracies that often compromise electoral processes. Using a centralized database that consolidates information from local and national registers, Sidalih guarantees that the electoral data remains up to date and reflect the voting population. This innovation attenuates not only the differences in the information of the voters, but also improves the process of verification of potential voters, as evidenced by Miransyah et al. (2020),

which indicates a significant reduction in the complaints of voters concerning registration errors during the 2019 electoral cycle.

In addition, the technology underlying the Sidalih system promotes greater transparency in the electoral process. The accessibility of voters data has been transformed by user -friendly interfaces that allow electoral officials and the general public to recover and verify the information from voters with relative ease. These improvements promote civic engagement because citizens can more easily access information concerning their eligibility for voting and their electoral rights. As Miransyah et al. (2020), the operational success of the system during the elections illustrates a transformer change to an enlightened electorate, strengthening the democratic process thanks to increased participation.

However, the implementation of the Sidalih system is not without challenges. The transition of traditional manual systems to a digital framework has exposed several technical and bureaucratic obstacles. For example, inconsistencies in data entry, training deficiencies among electoral staff and limitations of infrastructure in distant areas constitute considerable threats to data accuracy and system reliability. The results of Miransyah et al. (2020) reveal that despite the overall success of the Sidalih system, localized differences have remained, which indicates that the full potential of the system had not yet been carried out in certain jurisdictions.

To overcome these obstacles, targeted recommendations must be continued. First, complete training programs for electoral managers are essential to guarantee control of the use of the Sidalih platform. By equipping the staff with the skills and knowledge necessary, the potential for human error in the entry and data management can be considerably reduced. Second, improving the digital infrastructure, especially in rural and underdeveloped regions, is essential to guarantee equitable access to the system. Investments in Internet connectivity and technical support can fill the digital divide which is currently hindering the efficiency of Sidalih.

In addition, the establishment of a robust feedback mechanism will allow stakeholders to point out the problems linked to the management of voter data in real time, allowing faster corrections and continuous system improvements. Miransyah et al. (2020) suggest that the integration of community participation in the electoral process thanks to regular awareness -raising and education campaigns can promote confidence and improve the accuracy of the data recorded in Sidalih.

In summary, while the Sidalih system marks a significant front step in the management of voter data in Indonesia, continuous efforts are necessary to effectively meet its challenges and make the most of its innovative capacities. The ideas of Miransyah et al. (2020) illuminating the path to follow, stressing the importance of treating the aspects of infrastructure, training and engagement of stakeholders to improve the overall efficiency of the system., The Sidalih system (Pemilih Dan Hak Suara System System) represents significant progress in the data management of the data of Indonesian voters. This system, designed to simplify the process of recording voters and improve the accuracy of the lists of voters, has a convincing link for the principles of transparency articulated by Zahra et al. (2024). One of the fundamental principles of electoral transparency is the accessibility and reliability of the electoral data, the factors that Sidalih aims to strengthen.

First of all, Sidalih democratizes access to voters' information by allowing various interested parties, including political parties, civil and electorate company organizations, to engage with electoral data. Zahra et al. (2024) They underline that transparency is based on complete access to information, which promotes trust between the components and reduces the probability of electoral fraud. By digitizing the data of the voters and making it accessible, Sidalih not only encourages informed participation, but also facilitates monitoring. The transparency offered by Sidalih is crucial in an electoral context in which disinformation can significantly undermine democratic processes.

In addition, Sidalih's real -time data processing skills provide a verifiable source of information during the electoral cycle, an aspect highlighted by Zahra et al. (2024) as an integral part of the maintenance of the integrity of the electoral process. With timely updates to the shots of the voters and the ability to keep track of changes in real time, Sidalih guarantees that any discrepancy or anomalies can be faced quickly and transparent. This reactivity helps to strengthen the credibility of the electoral results, since the interested parties can observe the electoral process taking place with a level of control that had previously been hindered by bulky traditional systems.

However, the implementation of the Sidalih system is not without challenges that can inhibit its potential to completely promote transparency. Data privacy issues, threats to computer security and digital division must be addressed to improve Sidalih's effectiveness. As identified by Zahra et al. (2024), the principle of transparency must be balanced with the safeguarding of personal data to maintain the trust of the public. The potential for the improper use of the information of the voters, either through unauthorized access or data violations, represents a serious challenge in maintaining the integrity of the system. Observers and interested parties must support solid data protection measures and IT security protocols to effectively mitigate these risks.

In addition, disparities in digital literacy and access can undermine the general efficacy of the Sidalih system. The principles outlined by Zahra et al. (2024) ask for inclusiveness in the electoral process, underlining the need to ensure that all voters, regardless of the socio -economic state, are authorized to engage with digital systems. The initiatives aimed at improving digital literacy between voters, in particular in rural or underlying areas, are essential to guarantee the same access to information and promote greater trust of the public in the electoral system.

To overcome these challenges, the recommendations to improve the effectiveness of the Sidalih system include investments in solid IT security paintings and the creation of awareness programs aimed at increasing digital literacy between voters. In addition, establishing transparent protocols for the management and protection of personal data will be essential to ensure that trust in the electoral process remains intact. Aligning the operational practices of the Sidalih system with the principles married by Zahra et al. (2024), Indonesia can further consolidate the foundations of electoral transparency and improve citizens' commitment in the electoral process., The implementation of the Sidalih System (System Informasi Data Pemilih) in Indonesia represents a significant change in the way in which voter data is managed, however, it does not lack challenges. One of the main concerns, as explored by Utama et al. (2024), is cybersecurity, which has become a critical issue due to the sensitive nature of voter data. The integrity and confidentiality of electoral information are essential to maintain public confidence and guarantee a fair democratic process. However, the rapid digitalization of voter data through the Sidalih system has made it more and more vulnerable to cyber threats.

Utama et al. (2024) Identify several prominent challenges of specific cybersecurity of the Sidalih system. Among them is the threat of data violations, where unauthorized access to voter information can lead to the manipulation of electoral processes, identity theft and the possible deprivation of voter rights. The interconnected nature of digital systems means that any vulnerability can be exploited, which affects the entire electoral framework. In addition, the challenge is aggravated by the sophistication of modern cyber-attacks, which continually evolve to avoid existing security measures.

Data protection measures within the Sidalih system also pose significant concerns. Utama et al. (2024) Delineate deficiencies in the existing framework for data encryption, access control and incident response protocols. Inappropriate encryption protocols can leave data from sensitive voters susceptible to interception during transmission. In addition, ineffective access control measures run

the risk of unauthorized personnel that obtains confidential information, thus exacerbating misuse potential. The lack of a robust response strategy means that in the case of data violation, the repercussions could be severe, undermining all electoral integrity.

Another challenge highlighted by Utama et al. (2024) Refers to training and resources available for personnel that manage the Sidalih system. Frequent updates to cybersecurity protocols and the increasingly complex panorama of cyber threats require regular training sessions to equip personnel with the necessary skills. However, many local electoral authorities face budget limitations that prevent the ability to provide adequate training. Consequently, this lack of preparation can lead to systemic vulnerabilities in the operation of the Sidalih system.

In addition, public awareness and understanding of data privacy rights with respect to the Sidalih system remain limited. Utama et al. (2024) Underline that the low level of consciousness of the general public regarding data protection exacerbates the risks associated with voter data management. When people are not informed about their rights, they are less likely to take precautions to safeguard their personal information, which increases the general vulnerability of the electoral system.

When addressing these challenges, Utama et al. (2024) propose several recommendations aimed at improving cybersecurity and data protection mechanisms within the Sidalih system. They recommend the establishment of comprehensive cyber security protocols that include advanced encryption methods, solid access control systems and a simplified incident response framework. In addition, they advocate the assignment of sufficient resources for continuous training of electoral staff to develop a culture of cybersecurity awareness at all levels of operation. Public awareness campaigns can also be essential to educate citizens about their data protection rights, promoting a more informed electorate that is actively involved in safeguarding confidential information.

Therefore, although the Sidalih system announces the advances in the management of voters data in Indonesia, the challenges are described in this document to strengthen the resistance of the system against cyber security threats and establish a culture of data protection that includes both the electoral and the public authorities., The adoption and implementation of the Sidalih (Sistem Data Pemilih) system in Indonesia reveal important technological inequalities that affect the management of voters data in the context of digital transformation. As identified by Harminto et al. (2024), these inequalities are manifested in several dimensions, which has an impact on both the effectiveness of the Sidalih system and the global electoral process.

First and foremost, the digital fracture in Indonesia is a leading problem affecting the effectiveness of the Sidalih system. The regions characterized by lower levels of technological infrastructure, in particular in rural and distant areas, often experience inadequate internet connectivity, which hinders access to the Sidalih platform. This disparity obliges electoral officials and voters to rely on obsolete methods for the collection and verification of data, perpetuating the cycle of ineffectiveness and exclusion. Harminto et al. Underline that geographic disparities considerably influence access to digital tools, thus requiring targeted interventions to improve connectivity and facilitate fair access to the system through various demographic data.

The scenario further complicates the levels of digital literacy among the population. Harminto et al. (2024) highlight the lack of training and familiarity with digital platforms among certain electorate segments, in particular among older voters and those of lower socio-economic supports. This digital literacy gap undermines the potential engagement with the Sidalih system, now private people who can lack skills or confidence to navigate in the registration processes for digital voters. To alleviate these challenges, complete educational initiatives focused on digital literacy could be an

integral part of the promotion of a greater understanding of the public and the use of the Sidalih system.

In addition to infrastructural and educational inequalities, there are also systemic problems associated with governance that hinder the practical deployment of Sidealih. For an effective digital transformation, transparency and confidence in governance structures are essential. Harminto et al. (2024) Note that skepticism towards government institutions can result in reluctance to adopt new technologies, in particular when historically anchored challenges such as corruption and poor management of electoral processes remain unresolved. These questions related to governance can create an environment of uncertainty, where citizens can question the integrity of a digital system like Sidalih, thus limiting its adoption.

In addition, the political landscape in Indonesia poses an additional challenge. Political entities can take advantage of technological inequalities to manipulate the perceptions and behaviors of voters. As indicated by Harminto et al., The dynamics of power and competition can lead to the strategic restraint of the technological advantages of specific voter segments, more exacerbating existing inequalities. Consequently, the implementation of the Sidalih system risks strengthening existing social divisions rather than filling the gap, unless concerted efforts are made to promote inclusiveness in the digital transformation process.

To fight against these multifaceted technological inequalities, Harminto et al. (2024) Defending the creation of a global approach that combines the development of infrastructure, educational programs and institutional reforms to improve digital commitment and trust. These strategies could help promote an equitable landscape where the advantages of the Sidalih system are accessible to all demographic data, thus achieving its planned impact on improving the management of voters and the electoral process in Indonesia.

In summary, the technological inequalities present in Indonesia pose important challenges to the effective adoption of the Sidealih system. Understanding these obstacles is crucial for decision - makers and stakeholders aimed at implementing successful digital transformation initiatives which strengthen electoral integrity and inclusiveness., The implementation of the Sidalih system, designed to improve voter data management in Indonesia, faces mainly various bureaucratic and administrative challenges that inhibit their full resources. Although the system has a remarkable potential for simplifying electoral processes, several systemic problems persist that it undermines the effectiveness of its implementation. This section critically examines these issues, based on the strategies proposed by Pratama and Amalia (2020) to promote effective governance in the field of digital transformation.

The application of technology in voter data collection serves several important functions that are critical to electoral integrity. Modern systems have facilitated the digitization of voter lists, which allows for the rapid and precise collection of voter information, thereby minimizing the incidence of errors often associated with manual data entry. Such changes not only improve data quality, but also position political systems to better understand and approach dynamic voter demographics. As advocated by Da Silva Neto and Chiarini (2021), this approach not only accelerates the voter integration process, but also significantly increases the capacity of electoral organizations to follow voter turnout trends and identify potential priorities. The following summarizes the impact of the Sidalih transformation from the 3 aspects previously described:

Tabel 1. Impact of Sidalih Transformation

Aspects	Impact of Sidalih Transformation
Transparency	Increase transparency in voter data collection and management by using automated systems that can access data in real-time.

	Platforms such as hakpilihmu.co.id give voters direct access to verify their registration status, which allows for further oversight and reduces data manipulation.
	The implementation of open data allows the public to independently monitor the electoral process, which reduces doubts about the integrity of the process and strengthens the transparency of election administrators.
Public Trust	The implementation of automated and digital systems reduces human error, improves the accuracy of voter data, and provides more accurate and timely results, which strengthens public confidence in the integrity of election results.
	The use of biometric technologies such as fingerprint verification and facial recognition reduces the risk of vote manipulation and increases the sense of security for voters, thereby increasing trust in the electoral process.
	transparency in registration and data management systems helps to reduce distrust of election results and restore public confidence in election administrators that was previously affected by credibility issues.
Public Perception	A transparent and accurate system improves the image of the KPU as a professional and responsible institution, thus improving public perception of the independence and neutrality of the EMB.
	The success of the technology-based system provides a positive image to the public, showing that the electoral system in Indonesia is increasingly modern and efficient, and is able to overcome the historical challenges of slow and error-prone manual processes.
	The use of easily accessible apps and online platforms increased voter turnout, especially among younger citizens, influencing their perception of the importance of participating in democracy and strengthening their trust in the electoral system.

Source: Data processed by researchers, 2024.

Challenges and Barriers from Sidalih Activities

The challenges surrounding software and data integrity in Indonesia's election voter data management are a complex interaction of technical, organizational, and external factors. Addressing these issues requires a coordinated strategy that prioritizes reliable software solutions, effective organizational practices, and proactive measures to mitigate external threats and vulnerabilities. Such an approach is critical to building a resilient voter data ecosystem capable of supporting the integrity of Indonesia's electoral processes. The digital transformation of Indonesia's voter data information system (VIS) has been criticized by threats to IT security, which represent a significant risk of data breaches and consequently compromise the integrity of the electoral process and public trust. While Indonesia seeks to modernize its electoral picture, the integration of technologies has made the VIS increasingly vulnerable to a range of IT threats. These threats can be classified on several levels, which include technical vulnerabilities, strategic attacks, and socio-political manipulation, each contributing to a complex web of challenges that undermine effective voter data reconciliation.

From a technical standpoint, the Vis infrastructure has shown more security flaws, particularly in its data storage and transmission systems. Vulnerabilities such as inadequate encryption protocols, insufficient access controls, and outdated software contribute to the vulnerability of voter data to unauthorized access and exploitation. Cybersecurity experts underscore the risks associated with using Legacy systems that have not been updated to counteract contemporary threats. This outdated infrastructure is often characterized by compatibility issues, which creates potential entry points for malicious actors. Furthermore, the lack of complete computer security training for staff involved in Vis exacerbated these vulnerabilities, exposing gaps both in skills and in awareness of the importance of keeping sensitive election data secure.

Organizational constraints also need attention, particularly in terms of governance and responsibility mechanisms within the agencies responsible for VDI management. Governments are

often criticized for their slow response to emerging computer security threats, leaving exposed and unprotected systems exposed. Fragmented oversight and lack of a cohesive IT security policy contribute to the low level of preparation. When breaches occur, response mechanisms often prove inadequate, indicating a disjointed approach to accident management. In addition, limited resource allocation for IT security investments has hindered the creation of advanced protection measures and accident response capacity, further exposing VDI to potential threats.

External barriers, including the broader geopolitical landscape and evolving threat vectors, further challenge the integrity of the VDI. Computer attacks are becoming increasingly sophisticated, with groups possibly targeting electoral infrastructure to manipulate results or disrupt processes. In the Indonesian context, this is particularly worrying, as the country has reported attempts at interference by foreign actors trying to undermine national stability. Additionally, social media platforms have been shut down for disinformation campaigns, further eroding public trust in the electoral process. These external threats not only complicate the technical challenges of protecting voter data, but also mistrust among voters, which increases skepticism towards the reliability of VDI.

However, the transition to a digital management system is accompanied by a series of challenges that must be addressed to fully create the potential of Sidalih. Questions such as data privacy, threats to computer security and digital division raise critical concerns that could undermine the effectiveness of the system. Ferdyanto et al. (2023) identify the need for solid data protection measures and the continuous education of voters regarding digital literacy as essential steps to mitigate these vulnerabilities.

Furthermore, the successful implementation of Sidali depends on the commitment of the government to invest in infrastructure and human resources necessary. The disparities of access to technology between the various demographic data in Indonesia can represent obstacles to the universal adoption of the system. It is essential that the Indonesian government, together with the pertinent parties, gives priority to the initiatives aimed at filling this digital division, ensuring that all citizens can fully interact with the electoral process facilitated by Sidalih.

The recommendations to overcome the identified challenges include the improvement of collaboration between government institutions and technological platforms to encourage an approach cohesive to digital transformation into electoral management. The increase in investments in IT security infrastructures is also essential to protect the sensitive information of voters from potential violations. In addition, complete training programs for electoral officials and large public awareness campaigns can help raise awareness of the functionality and benefits of Sidalih, in the end, bringing a greater trust of the public in the electoral process.

In summary, the Sidalih system embodies a transformative force in the management of the data of the voters in Indonesia, which represent both opportunities and challenges in the realm of digital transformation. While its innovations open the way to an improved electoral picture, facing the accompaniment challenges through strategic recommendations will be crucial to ensure that the electoral future of Indonesia is safe and inclusive. The forward path requires a commitment to continuous improvement and adaptation in the face of emerging technologies, thus promoting a resilient democratic environment and fair in Indonesia

CONCLUSION

Based on the results of the research that has been conducted, the transformation of *ICT*-based election administration in Indonesia, especially in the *Sidalih* case study, reveals several important findings. The implementation of digital transformation in elections through *Sidalih* has demonstrated

significant effectiveness in improving transparency and efficiency in the process of updating voter data in Indonesia. The system is able to reduce various traditional problems such as duplicate data and manual processes that are prone to manipulation or human error. The main obstacle in the implementation of election digitization through *Sidalih* in Indonesia lies in the uneven technological infrastructure, particularly in remote areas. In many regions, limited internet access and inadequate hardware hinder the smooth operation of the *Sidalih* system. Without adequate infrastructure support, the process of updating voter data is hampered, and the quality of the data produced becomes inconsistent. The implications of digital transformation through *Sidalih* for election governance are significant, especially in increasing transparency and accountability in the administration of elections. Digital-based updating of voter data enables faster, more accurate, and more accessible information to the public, which has the potential to reduce fraudulent practices such as voter data manipulation.

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