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Election in the digital period: a literature review

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ABSTRACT

The discourses to hold electronic elections or E-Voting also emerged in Indonesia. Several public figures stated that Indonesia needed to hold electronic elections. Before deciding to implement E-Voting, it is necessary to consider various aspects to maintain election principles. This article reviewed the implementation of elections in India, Estonia, Canada, and Brazil that have implemented E-Voting. The research method in this research was a literature review. The analysis results showed that India and Brazil used an E-Voting system with a machine or a DRE system. Estonia and Canada used the internet or I-Voting system. Public trust needed to be considered based on the four countries implementing E-Voting. Network stability, access to digital voters, and ease of access were obstacles that Estonia and Canada faced in implementing the I-Voting system. Voter participation, engine performance, and power grids were obstacles that India and Brazil faced in implementing the DRE system. Based on experiences from India, Brazil, Estonia, and Canada, Indonesia must design specific strategies to minimize the risk of implementing E-Voting in elections. Therefore, the advice that can be given is that the implementation of E-Voting can be started in stages and accompanied by efforts to equalize digital infrastructure in various regions and digital education in the community.

Keywords:
Elections; E-Voting; I-Voting; DRE System; Public Trust

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INTRODUCTION

Based on the results of the International Commission of Jurist conference held in Bangkok in 1965, one of the conditions for a country that adheres to a democratic system is the implementation of free elections (Suny, 1978). As a democratic country, Indonesia has successfully held an election for the first time after 10 years of its independence. Since the elections in 2019, Indonesia has been implemented 12 elections, namely in 1955, 1971, 1977, 1982, 1989, 1992, 1997, 1999, 2004, 2009, 2014, and 2019. It needs to be highlighted that New Order's elections were not similar to the post-New Order's election (Setyaningrum, 2022).

Implementing general elections or elections is essential for countries that adhere to a democratic system, including Indonesia. The word *democracy* comes from the Greek, namely '*Demos',* which means people, and '*Kratos',* which means authority. It can be interpreted literally that democracy is government by the people (Liphart & Arend, 1984). Democracy

as a political idea has five characteristics: 1) Having equal voting rights in determining binding collective decisions, 2) Every citizen has the same opportunity, 3) Every citizen has the same opportunity to be able to provide an assessment of the running of the political process and governance, 4) The final control over the agenda where executive decisions determine which agenda should and should not be decided through the government process, 5) Relation to the law includes all adult society (Dahl, 1985). These five characteristics show that a democratic country must involve its citizens in determining its leader at a national or regional level, and also their representatives in the legislative body. Therefore, election implementation is an essential agenda for a democratic country.

The election is a formal process in selecting someone to serve in a particular position (Webb et al., n.d.). These positions range from the president as the executive, the people's representatives as the legislature, to the village head. Therefore, holding election for a democratic country is vital because it involves the sustainability of the State and all its components. Given the importance of election, their implementation must also be prevented from all forms of violations that can hinder the achievement of the objectives of the election. The purpose of the election itself, according to Law Number 7 of 2017 Article 4, namely 1) Strengthening a democratic constitutional system, 2) Realizing fair and integrity elections, 3) Ensuring consistency of electoral system regulation, 4) Providing legal certainty and preventing duplication in election arrangements, and 5) Realizing effective and efficient election.

To achieve goals and minimize violations in the implementation of elections, the *International Institute For Democracy and Electoral Assistance* has compiled 15 standards that must be met in the implementation of elections, including 1) Structuring the legal framework, 2) The electoral system, 3) Determination of electoral districts, 4) The right to vote and be elected, 5) EMBs, 6) Voter registration and voter lists, 7) Vote access for candidates and political parties, 8) Democratic election campaigns, 9) Access to media and information disclosure on freedom of opinion, 10) Campaign funds and financing campaign, 11) Voting, 12) Vote counting and tabulation, 13) The role of the political party and candidate representation, 14) Election observers, and 15) Compliance and law enforcement (International Institute For Democracy and Electoral Assistance, 2001).

Indonesia is recorded to have held elections from 1955 to 2019 (Setyaningrum, 2022). In practice, the more often our country holds elections does not mean that the more problems decrease. Indeed, problems were still found in every election. Problems in elections were very diverse, and not a few reached the realm of law and caused social conflicts in society. The problems that have occurred included, 1) Errors in the voter registration process, 2) It was still often found that voters were wrong in marking the ballot paper in the end, it was declared invalid, 3) The process of collecting votes was relatively slow due to the geographical conditions of Indonesia's vast territory and time difference, 4) The process of counting votes in each region was also still relatively slow, 5) Taking too long in the process of collecting votes and counting had an impact on delays in sending results (Rokhman, 2011).

In 2019, simultaneous elections were held under the Constitutional Court's decision Number 14/PUU-XI/2013, which aims to achieve time and budget efficiency and reduce conflict. Simultaneous elections in 2019 also had various problems, including 1) Election logistics. In the 2019 election, 10,520 polling stations experienced a shortage of election logistics. The ballot boxes received by 6,474 polling stations were not sealed. There were also ballots being swapped between regions and polling stations at 3,411 polling stations. 2) Voter data problems occurred in the 2019 election. Updating the permanent voter list was only completed on April 8, 2019, or nine days before the election. It happened because the

KPU (*General Election Commission*) has problems with sorting voter data following the data from the Ministry of Home Affairs. 3) the Polling Station Working Committees (KPPS) have a heavy workload and cause a lot of casualties. Based on data from the Ministry of Health, on May 16, 2019, as many as 527 KPPS officers passed away, and 11,239 fell ill. 4) There were errors in the recapitulation of vote counting. Based on the records of several organizations, there were 708 recapitulation errors, especially the swapped C1 data and data input errors to the system (Ardipandanto, 2019).

Problems and challenges in every election administration will always occur, small ones that do not have much impact or large ones that can have a considerable impact. Hence, strategies are needed to overcome problems and challenges that often occur repeatedly and face possible problems. Based on previous research, problems that repeatedly occurred in the implementation of elections in Indonesia included the recapitulation of the permanent voter list, which often experienced obstacles, such as in the 2019 election, where multiple voters were still found (Putri, 2018). The process of counting votes is relatively slow due to the distribution of ballots and errors in vote recapitulation (Ardipandanto, 2019).

The causes of some of these problems included the vast territory of Indonesia, so it took time to distribute election logistics. This population identity data collection system has not fully utilized information technology, so multiple population data were often found, as well as the lengthy process of voting and recapitulation of vote counting, which was relatively time-consuming because they still used conventional techniques and have not maximized the utilization of information technology developments.

Several other countries have used the *E-voting* technique in organizing elections by utilizing various technological developments. The rapid flow of communication marked the era of elections with electronic systems, information technology grew rapidly, and political actors have been busy taking advantage of digital developments (Garnett & James, 2020). Countries implementing an *E-voting* system included Germany, the United States, the Netherlands, Switzerland, Greece, Estonia, the Philippines, Nigeria, and various other countries. Populations scattered in various directions, and time and cost efficiency were why these countries used information technology to organize elections (Habibi & Nurmandi, 2018). Another Asian country that has started implementing an electronic election system is the Philippines. In its implementation, the Philippines not only combines democracy with the use of information technology but also in the government system (Gushardana et al., 2020).

Nowadays, various countries that have not implemented *digitalization* in elections are preparing to implement *E-voting*. The discourses on implementing *E-voting* in elections emerge in Indonesia towards the 2024 elections. Various figures said that Indonesia needed to immediately implement digital media for the efficiency of the election process. Others argued that the implementation of election digitization in Indonesia still required in-depth study, considering that not all regions in Indonesia could access the internet (Husna, 2022).

Electronic voting or *E-Voting* consists of the recording, polling, and voting in political elections and their referendums involving information and communication technology. The general functions of the *E-Voting* system are randomization, communication, and security systems (IDEA, 2011). The electronic voting system consists of four types, including 1) a voting machine or voting with the direct electronic recording or the DRE system, 2) an OMR system where the voting machine can recognize the voter's choice on a ballot that a particular machine, 3) a voicemail printing machine where paper ballots can be read by a machine containing voters' choices, and 4) a voting system via the internet where the voter's votes are directly given to the calculation server (IDEA, 2011).

E-Voting systems can be divided into two types: those that use the internet and those that do not. *E-Voting* systems using the internet are divided into three types: *internet poll site voting, kiosk voting,* and *internet voting* (Kersting & Baldersheim, 2004). This type of *E-Voting* internet poll site that utilizes the internet is used to send data from polling stations (TPS) to local election organizers in Indonesia or often called KPUD (Regional Election Commission), then regional, and central. This type of voting works on a public computer and is similar to a voting system using machines-connecting TPS to the center via the internet network.

This type of *Kiosk voting* can be used with special computers placed in areas that are easily accessible to the public. This type of *E-Voting* requires a particular validation instrument because the election organizers cannot directly control the election process. *Internet voting* is the use of internet media to exercise voting rights. The use of internet voting can be done anywhere the voters are as long as they have the device and internet access. This type of election using internet voting requires *software* programs and other measuring tools.

Electronic voting, or *E-Voting*, has a series of advantages and disadvantages that need to be considered in formulating a strategy for implementing *E-voting* in elections. The advantages of electronic elections include: 1) Counting votes faster, 2) Getting more accurate results, 3) Uncomplicated displaying of ballots, 4) Increasing convenience for voters, 5) Increasing voter participation, 6) Preventing fraud during delivery and tabulation of results, 7) Improving accessibility, 8) Using Multilingual screens, 9) Reducing of unauthorized voices, 10) Potentially saving on budget, and 11) Getting time efficiency (IDEA, 2011).

The drawbacks of the electronic voting system are 1) Lacking transparency, 2) Having limited openness to non-experts, 3) Requiring mutually agreed on system certification, 4) Potentially violating confidentiality, 5) Getting risks of manipulation and hacking, 6) Increasing purchasing costs or maintenance of the *E-voting* system, 7) Increasing need for infrastructure related to information technology, 8) Lacking control by the organizers due to the high level of dependence on vendors, 9) Limiting the possibility of recounting votes, 10) Potentially conflicting with the law, and 11) Potentially reducing rates public trust (IDEA, 2011).

Efforts to use the electoral system using simple electronic media have been implemented in Bengkulu City. Based on the research results, the application has not been comprehensive because it was constrained by various technical and non-technical things (Suri & Yuneva, 2021). Another research was conducted in villages experimenting with selecting an electronic system. The research found a need for a strategy that did not damage democratic values in the electronic electoral system (Hapsara et al., 2017).

Before all regions in Indonesia decide to implement an electronic voting system, Indonesia needs to learn from other countries that have implemented *E-Voting* to minimize the shortcomings and obstacles that other countries have experienced with the electronic voting system. Therefore, the objective of writing this article was to describe alternative voting methods in the digital era based on case studies of the implementation of *E-Voting* in various countries.

METHOD

This research used a qualitative approach. A qualitative research method is used to examine the condition of natural objects, where the researcher is the key instrument. Furthermore, the data collection technique is carried out by triangulation (combined), data analysis is inductive, and qualitative research results emphasize meaning rather than generalization (Sugiyono, 2015). Meanwhile, the research design was a *literature review*. A

literature review is scientific research that focuses on a particular topic. This literature review research allows researchers to identify and develop theories or methods, as well as identify theories with existing gaps in research results (Rowley & Slack, 2004). The literature review consisted of 1) collecting data/information, 2) evaluating data or research results, and 3) analyzing publication results related to research questions.

The data collection technique used in this research was a *literature review* sourced from journal articles on this research topic. Sources of supporting data came from books, documents, written news, and regulations that applied to the research area studied by the primary source of this research, namely journal articles.

RESULT AND DISCUSSION

Until 2010, 47 countries had implemented an electronic voting system based on data compiled by the AEC project. The 47 countries that have implemented electronic elections could be divided into two categories based on the electronic voting system used. The two categories are the *E-Voting* system with a voting machine and the *E-Voting* system with the internet (Habibi & Nurmandi, 2018).

Of the 47 countries that have implemented *E-Voting*, the author sought to describe four countries that have implemented electronic elections with different electoral systems in this article. The four countries consisted of Estonia, Canada, India, and Brazil. This paper also described the advantages and disadvantages of the electronic electoral system that these countries have implemented.

1. Electronic Voting System in Estonia

Estonia is a country that implements a multi-party democracy system and has a population of 1.3 million people. Estonia joined the European Union in 2004, and since then, Estonia has held parliamentary elections, which are held every five years. The age that has entered the voting category in Estonia is at least 18 years old, except in local elections, the minimum voting age is 16 years (Ehin et al., 2022).

Before implementing *E-Voting* in elections, Estonia used a conventional electoral system, where ballots were in paper form. Electronic voting was used in Europe as a National election technique, and the first local elections were used in 2005. The Estonian government announced the idea of the general election using the internet in 2001.

The electronic voting system used in Estonia is an electronic voting system using the internet or *Internet voting*. The internet voting system implemented by Estonia in elections increases voter participation, increases interest in young voters, and allows for convenience in the voting process (OSCE & ODIHR, 2007).

The election process in Estonia using *internet voting* is as follows, 1) Voters start the election process by authenticating or verifying themselves using an electronic identity card or E-KTP from the application to the server, 2) Then, the server sends a list of candidates according to their chosen area, 3) Voters carry out the process of voting with the candidate they want to be elected, then encrypt their vote with the public key of the description server, sign the evidence, and send it to the server, 4) To ensure that the server is not in trouble or there is an element of fraud, the protocol asks for voting to the registration service separately, 5) Then, a process is carried out stating that the voting has been conducted or the verification of the vote. 6) Verification aims to ensure the votes that have been selected are following the voters' wishes. The voters can check the time that the election is carried out correctly. Verification is performed by providing a vote reference to the voting application. 7) Verification is applied by an independent device with a QR Code to maintain integrity further. 8) Voters' mobile devices receive back signed and time-stamped candidate lists (Ehin et al., 2022).

Based on the election with the *internet voting* system that Estonia had, the positive impact that could be felt was that voter participation increased, especially among those who lived outside Estonia. Furthermore, the number of citizens entitled to vote and live outside Estonia reached 80,000. Implementing the *internet voting* system in Estonian elections can facilitate citizen voting abroad, especially for those living in small countries with limited networks or embassies (Ehin et al., 2022).

Risks will always exist from a series of benefits or advantages of implementing an internet voting system in the implementation of elections in Estonia. The obstacle faced by Estonia in implementing the internet voting system in organizing elections was the stability of the internet network.

The benefits obtained from implementing the internet voting system in Estonia could be considered when Indonesia implements the *E-Voting* system with the internet. However, the obstacles and all the risks experienced by Estonia and other countries that have experienced the implementation of internet voting in elections need to be an in-depth study. The government needs to prepare specific strategies to minimize the risks that may be faced.

2. Electronic Voting System in Canada

Electronic elections in Canada were first implemented in the election of the Democratic Party leadership in 2003. Regional head elections were implemented from the implementation of the first electronic elections that became a pilot for voting with the internet. 60 Cities in two Canadian Provinces have implemented Internet voting. In 2010, 44 Canadian Cities held elections using the internet that could be conducted by voters remotely, and voter turnout grew by 73% (Goodman, 2014).

Canada uses the *E-Voting* system in elections via the internet or *internet voting*. The implementation of internet voting in Canada is similar to that in Estonia. Voters do not need to go to a polling station to cast their vote because it can be applied remotely through internet channels using the Canadian government's tools.

I-Voting that has been implemented in Canada has had a positive impact on increasing voter participation, especially among voters at the young age of 18-25 years. However, the implementation of *I-Voting* in elections was constrained by voters, especially elderly voters (Goodman, 2014). Using relatively minimal technology made it difficult for the elderly to make the selection process using the internet.

The *E-Voting* electoral system implemented by Canada using the internet was similar to Estonia. Based on the obstacles faced by Canada in implementing the *I-Voting* system, Indonesia needs to prepare particular strategies related to digital literacy in the community, especially for the elderly. The lack of digital capabilities will hinder the *I-Voting* system's election process. The principle of free and confidentiality in elections can be tarnished, especially if the *I-Voting* system from where each voter is challenged to monitor the implementation of election principles. The obstacles Canada has experienced in implementing the *I-Voting* system of elections need to be in-depth study material for Indonesia and prepare the best strategy if it adopts the system.

3. Electronic Voting System in India

India is one of the countries that implement *E-Voting* in every general election. The first time India used *E-Voting* in general elections was in 1989-1990 in holding local elections in several states. In that election, India implemented *E-Voting* experimentally in 16 local elections (Wolchok et al., 2010). India officially implemented *E-Voting* in 1998 in the legislative and national elections in 2004. In the subsequent elections, India consistently and continuously used *E-Voting* at the local, central, and state levels.

The electronic voting system or *E-Voting* implemented in India used the *Election Voting Machine* (EVM). The EVM machines were placed at each polling station (TPS). EVM is a machine that records voter choices without using paper. In the 2009 elections, India used 1.4 million EVM. EVM, which Indian government-owned companies provide, consists of *Electronic Corporation of India* and Bharat Electronics (Reddy, 2011).

The advantages of using EVM as an *E-Voting* system in India in holding elections were 1) cost-efficient, which only reached 200$, 2) easy to use by both officers and voters, 3) EVM machines can function not only with electricity but also batteries, 4) minimize the use of paper and ballot boxes because EVM can be used again for the upcoming elections, and 5) the number of TPS does not need to be significant because EVM can accommodate many voters (Reddy, 2011).

However, from the benefits of using EVM that can be obtained, it is also necessary to consider the risks of using EVM. The first generation EVM models use the Hitachi 6305 engine and *firmware*. These first-generation EVMs are vulnerable to manipulation and hacking. India continues to improve by upgrading the EVM by issuing the second generation EVM used in the 2004 elections. In the 2014 elections, India used EVM with VVAT (*Voter Verified Paper Audit Trail*), using paper evidence after completing their voting rights (Reddy, 2011).

With *E-Voting* using EVM implemented by India in the implementation of elections, in addition to the risk from EVM itself, India also faces the problem that some people are less interested in coming to polling stations to exercise their voting rights (A., 2016).

EVM in holding general elections in India can be used as an alternative in general elections in Indonesia when implementing the *E-Voting* system—considering the benefits of using EVM, which can facilitate the implementation of elections in Indonesia. However, it still has to be adapted to the conditions of the Indonesian community, and upgrades to machines are carried out regularly to minimize risks so that the principles and objectives of the election are maintained and achieved.

4. Electronic Voting System in Brazil

Brazil began implementing *E-Voting* in elections by developing a computerized central voter *database* system in 1986. It was aimed at streamlining voter registration to be centralized. The agency responsible for administering Brazil's elections is raising the goal of using technology in elections. The goal is to automate the vote counting process. In the 1994 election, the automatic vote counting process began to apply to Brazil's elections (Avgerou, 2013).

In 1996, the voting machine and software that the IT team had entirely designed were tested in elections in all Brazilian cities. Elections using machines and *software* in Brazil were officially used in 2000. The *E-Voting* system implemented in Brazil used a *direct recording electronic device* (DRE) machine (Avgerou, 2013). The DRE system is a voting or voting machine with direct electronic recording (IDEA, 2011).

E-Voting system using a machine or DRE voters must come to the polling station and conventional elections. In implementing the *E-Voting* with DRE system in Brazil, the voting machine has two terminals connected at each polling station. Officers use the first terminal to identify voters, and the second terminal is a DRE machine that voters use to vote. Voters type in the number of candidates to be selected. Then, the screen will display the candidate's name, photo, and party. Furthermore, the selector presses the enter key to select.

The machine stores vote data, the time in running the election process, the voter's initials for each vote, the time the machine is stopped due to a power failure, and requests to print. Furthermore, all forms of technical disturbances that are "intentional"

or not will be recorded to prevent fraud. The positive impact of implementing *E-Voting* using a machine or DRE system in Brazil is that it can streamline time and budget. Constraints faced by the power supply significantly affect engine performance (Avgerou, 2013).

Brazil has faced several obstacles with the DRE system in elections officially implemented in 2000. Suppose Indonesia adopts the system that Brazil has implemented. In that case, it needs to ensure the ability of voters and officials to operate the DRE system and the security of the electricity supply during the election.

Based on the explanation of electronic elections that have been implemented in various countries, if Indonesia implements an *E-Voting* system in the upcoming elections, considering the vast territory of Indonesia, the benefits that will be obtained include a fast-voting process, the process of recapitulating ballots from the TPS to the center quickly, minimizing letters multiple votes, the efficiency of the ballot budget, and the efficiency of the election management committee. Meanwhile, the drawback of the *E-Voting* system, if applied to elections in Indonesia, is that not all regions in Indonesia have adequate internet access. It takes time to educate the public on digital and vulnerable electronic security systems, especially for the elderly (Bachmid & Djanggaih, 2022), Another research also found that it was prone to conflict from public distrust of the election result calculation system (Mahpudin, 2019).

CONCLUSION

A general election is one of the indicators of a country that implements a democratic system correctly. Therefore, elections are often also referred to as democratic parties. The election is a formal process in choosing someone to serve in certain positions in both the executive and legislative branches. The electronic election system is being discussed in Indonesia to be more efficient in terms of time and costs. Based on the research results above, electronic electoral systems used the internet and non-internet. India and Brazil are two countries that hold electronic elections using a *direct recording election* device (DRE) system or using a machine. Meanwhile, Estonia and Canada use an internet voting system or *I-Voting* in their electronic elections. The benefits or advantages of implementing *E-Voting*, either the DRE or *I-Voting* systems, are the efficiency of election time and budget. Meanwhile, the risks faced include the level of public trust, the workings of the DRE machine, the stability of the electricity supply, the ability of officers and voters, the level of participation for those who use DRE, and the stability of the internet network. Based on the various risks experienced by countries that have held *E-Voting*, Indonesia needs to prepare specific strategies to minimize risks. Given the vast territory of Indonesia with various levels of education and culture, not all regions of Indonesia can access electricity or the internet easily.

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