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Belgium, Brazil, Estonia – three visions of electronic voting

SUMMARY The text analyzes the expanding role of technology in democracy, focusing on electronic voting (e-voting). With technological development, various fields have begun to use new solutions, and the same has occurred with democracy, which in this context can be described as e-democracy, with e-voting forming an integral part of it. Despite its many positive assumptions, technology-based voting, as a relatively new phenomenon, is often perceived as unfamiliar, uncertain, or risky. The article presents the solutions adopted by Belgium, Brazil, and Estonia. These countries are at different stages of e-voting advancement, have adopted different technological approaches, and express differing views on e-voting. In addition to examining the e-voting methods themselves, the analysis also takes into account demographic factors and electoral regulations. As a result, the e-voting systems presented do not focus solely on technological solutions but instead offer a broader picture of the phenomenon.

KEYWORDS Belgium, Brazil, Estonia, electronic voting, e-voting, electronic democracy, e-democracy

Introduction

Technology exerts a tremendous influence on society around the world. Due to its rapid development, many spheres of public life have undergone changes and moved online. This also applies to the election process. An increasing number of countries, due to the possibility of speeding up the announcement of results and reducing costs, are considering or have already decided to implement fully or partially electronic voting systems. The crisis of democracy, linked

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to declining voter turnout in many countries, is also putting pressure on those in power to encourage voters to participate effectively in the election process. However, even now, in the current political discourse, arguments are being raised about the possibility of greater use of direct democracy through the implementation of electronic voting tools. Therefore, the development of electronic voting may prove to be key to the further progress of many countries, as well as to maintaining stability and continuity of governance within them.

The following article aims to present the methods of electronic voting used in Belgium, Brazil, and Estonia. It covers the idea behind the concept, its implementation, the current state, and an evaluation of this phenomenon.

To understand what the phenomenon of electronic voting (hereafter referred to as e-voting) is, I find it necessary to first explain the concept of e-democracy. The first ideas regarding the use of new technological advancements in politics emerged in the 1950s, and their originator was Norbert Wiener. He wanted to use computers for political negotiations, particularly for calculating risk. However, Wiener's idea faced criticism. Critics argued that technology should not be politicized and that computers can only perform analyses in simple situations, while politics is not a stable environment. The 1980s were an effective period for the development of e-democracy, marked by the popularization of personal computers and the rapid growth of television. It is worth noting that the first televised debate took place in 1960, with Nixon and Kennedy participating. However, it wasn't until the 1970s that there was a significant increase in the number of people owning and watching television. Another milestone was the emergence and rapid development of the internet in the 1990s. Thanks to the advent of the internet, communication became much easier and, importantly for politicians, cheaper (Vedel, 2006; Mzyk, 2020).

Grodzka defines this concept as follows:

> E-democracy can be defined as the application of information and telecommunication technologies to increase citizens' participation in democratic processes, both in terms of quantity and in the form of real influence exerted by individuals on the functioning of public institutions. (Grodzka, 2009)

Council of Europe created they own definition:

> E-democracy, as the support and enhancement of democracy, democratic institutions and democratic processes by means of ICT, is above all about democracy.

> Its main objective is the electronic support of democracy. E-democracy is one of several strategies for supporting democracy, democratic institutions and democratic processes and spreading democratic values. It is additional, complementary to, and interlinked with traditional processes of democracy. (Council of Europe, 2009)

Calabres and Borchet describe the essence of e-democracy as „Ideas about electronic democracy generally presuppose the existence and/or the possibility of citizens giving life to their views through exchanges in new forms of public space" (Calabres & Borchet, 1996).

E-democracy thus aims to transfer the entirety of public debate into the online sphere. We can talk about the phenomenon of e-voting on three levels. The first level involves using technology to present election results, which is widely used in most countries. The second level is electronically-assisted voting. This requires the voter to appear at a polling station, but their vote is cast using electronic devices (such as an electronic ballot box). The final level is fully electronic voting, where the voter casts their vote using their own electronic device. It is worth noting that no country uses only the final level of e-voting. Even though in Estonia it is possible to cast a fully electronic vote from any location, this is not the only available form of voting, as will be discussed later in the article.

Some researchers suggest an even more precise classification of terms, distinguishing i-voting (Internet voting) as a form of e-voting, which is further divided into Internet Voting at the Polling Place and Remote Internet Voting. In this classification, e-voting also includes e-referenda and e-voting procedures (Musiał-Karg, 2010).

E-voting has many supporters as well as opponents, due to its numerous advantages but also its drawbacks, the biggest of which is the novelty of this solution. Fear of change is natural, but technological development has now become a part of everyday life. It is worth noting that both the authorities of many countries and political parties use technological tools on a daily basis to communicate with voters. This is done through official channels such as government websites or social media platforms. Therefore, connecting democracy with technology is nothing new. During the COVID-19 pandemic, the state was forced to quickly develop new solutions to prevent the paralysis of key state institutions. This led to remote parliamentary sessions and the use of e-voting for voting. Thus, these tools should not be considered new; only the scale of their use is changing.

In countries with the largest populations, such as Brazil, which will be discussed in the following article, counting paper ballots across the entire country used to take several days. Thanks to the use of technology, election results are known immediately after the voting ends. Both the cost of organizing elections for the state and the cost incurred by citizens who wish to cast their votes in larger countries are reduced. National electoral commissions no longer need to hire as many people to manage elections. Voters, in fully electronic elections, do not bear the costs of traveling to polling stations. Additional benefits of implementing electronic voting may include an improvement in voter turnout. In many countries where voting is mandatory, the election process is conducted using technology (for example, Australia, Brazil, Belgium). Electronic voting significantly reduces paper usage, which is beneficial for the environment. Furthermore, in traditional voting, not all prepared ballots were ever used, so it was known that some would be destroyed after the elections without fulfilling their purpose. However, printing additional ballots is necessary due to potential printing errors, among other reasons.

As a disadvantage, the limited experience of countries in implementing e-voting on a large scale should certainly be mentioned. Worldwide, only a dozen or so countries have made attempts to introduce electronic voting in recent years. Only a few countries use e-voting widely in elections. In some countries, this option is available only to a selected group of citizens (e.g., people with disabilities). Therefore, new countries implementing e-voting cannot rely on the experiences of a large number of other nations. In terms of security, it is important to mention the potential for hacking attacks that could disrupt the voting process. This is especially possible at the third level of e-voting. At the second level, however, electronic ballot boxes can be used, which process the vote online and simultaneously print a paper receipt, allowing for manual vote counting in the event of a system failure. Despite the limited experience with e-voting worldwide, we already know that such a solution may not be economically viable in every small country. The purchase, servicing, and repair of the machines used for voting could, in the case of countries with small populations, generate higher costs than conducting traditional voting.

In the next part of the article, three countries using e-voting to varying extents and in different forms will be presented. The countries will be introduced in alphabetical order.

Belgium

Belgium is a federal country, ethnically diverse, with compulsory voting in place. The fine for not participating in an election ranges between 5 and 150 euros (Kużelewska, 2016). The decision to begin testing electronic voting in 1991 was not aimed at improving voter turnout, but at simplifying procedures and increasing transparency. In that year, the authorities decided to conduct electronic elections in two municipalities (Verlaine and Waarschoot), each using a different system. It was decided to continue using the magnetic card system in the future (Vegas González, 2012).

Upon arriving at the polling station, voters presented their ID cards and their voting summons (as citizens receive summons due to compulsory voting). An election commission representative, based on the provided documents, gave the voter a magnetic card, which was coded beforehand to make it usable. The magnetic card contained no information about who would use it. The voter then inserted the card into the electronic ballot box and cast their vote. It's important to note that the voter had the option to cast a blank vote, meaning not selecting any candidate.

In 2007, the authorities decided that the system needed modernization, and since 2012, the machine used to cast votes also prints the vote in paper form. The printout includes information about the candidate voted for (the paper must be folded so no one else can see the choice) and a QR code. The voter takes the printed paper to another machine, which scans the QR code and registers the vote for the chosen candidate. The voter then places the paper into a ballot box. In the event of system failure or any doubts, the election commission can manually count the paper ballots in a traditional manner.

Before the 1994 and 1999 elections, more and more municipalities expressed interest in implementing voting with the new technology. In 1994, 20% (1.4 million people) and in 1999, 44% (3.2 million people) of voters cast their ballots using e-voting (European Commission, 2023).

Due to significant linguistic diversity, the system operates in Flemish, French, and German. Until 2012, Belgium had two independent systems that were not compatible. Municipal authorities decided which company's system they wanted to use. The only condition was that municipalities within a given region had to use the same system. Currently, 185 municipalities (with over 4,000 polling stations) use the services of the company Smartmatic (Smartmatic, 2019). An event that also led to the dominance of the Smartmatic system was Wallonia's

decision to abandon electronic voting. The authorities of this region made this decision due to the costs and concerns about the transparency of elections. The costs generated by e-voting mainly involved the annual inspection of the machines. In a calendar year without elections, municipalities are required, at their own expense, to inspect at least 10% of the machines used in elections. In an election year, all machines must be inspected. The cost of these inspections and any necessary repairs is borne by the municipality.

Brazil

Brazil is considered a leading country in the development of technology for organizing electronic elections. As early as the 1980s, voters were able to register for elections using a computer. At the same time, discussions were underway about starting work on e-voting in the country. In 1995, the law was changed, and a year later, the first local elections were conducted using the technology. Since 2000, e-voting has been mandatory nationwide.

Brazilians, as pioneers of e-voting, are the inventors of electronic ballot boxes. To this day, many countries also use this invention (Japan, the United States, India, Turkey, etc.). Additionally, Brazilians provide their electronic ballot boxes to other South American countries.

There are two main reasons why Brazil aimed to develop electronic elections. The first is the country's large population, which made traditional vote counting take a long time. Additionally, reaching some parts of the country to conduct elections could be problematic, especially during the rainy season. Traditionally used ballot boxes and regulations required that polling stations be properly set up to conduct elections. The second reason was frequent mistakes or fraud. Nearly 15% of Brazil's population is illiterate, which made it difficult for them to cast their vote on paper ballots, where they had to read the candidates' names. Additionally, Brazilian law allowed, in some elections, voters to cast their vote by writing the candidate's name on the ballot. This was due to the large number of candidates running in the elections. Election commissions often struggled to read the names written by voters, resulting in a large number of invalid ballots (Schneider, 2020). It is worth noting that voting in Brazil is mandatory for most citizens. Voting is optional for individuals between the ages of 16 and 18, as well as for those over 70 years old. Additionally, military personnel do not participate in elections (Superior Electoral Court, 2024).

For this reason, Brazilians aimed to create the simplest possible voting system, one that wouldn't require reading. To vote in the election, the voter enters a two-digit number of their chosen candidate on the electronic ballot box, and the candidate's photo then appears on the screen. The voter can then confirm their choice or enter a different candidate's number. This makes voting extremely simple, requiring the voter only to remember the candidate's number. Voter verification is done by providing their individual personal number and digitally signing their vote.

After voting concludes, election commission members remove the memory card from each machine and deliver them to the local election office, which reads the results and sends them to the central office responsible for presenting the final results. Typically, the results from the entire country are published between one and three hours after voting ends.

In the case of electronic elections in Brazil, the issue of security has been raised multiple times. Every year, the Brazilian government commissions a group of IT specialists to test all security measures. However, these specialists have never succeeded in a successful hacking attempt on the system. In 2022, when there were renewed claims of possible election fraud after the presidential elections, Americans stated that the Brazilian model is a global standard for e-voting (*France 24*, 2022).

Estonia

E-voting in Estonia is unique on a national scale, as it is the only country in the world where one can participate in elections without leaving home. However, the country still does not meet the criteria of the third level, as voters can choose whether they want to vote electronically or in the traditional way.

The first e-elections in Estonia took place in 2005. Voters who wanted to cast their vote from their own computers had to purchase a special card reader, which they would connect to their computer. Then, they needed to insert their newest ID card or driver's license with a microchip into the reader to confirm their identity. The system was not fully developed, and voting was only possible by logging into a specific website through a particular internet browser. In the first elections, 1.9% of voters chose to cast their vote electronically. Although this was not a high percentage of voters, the government declared it a success because no issues were reported during the voting process (Madise & Martens, 2006). As a result, more and more citizens began to participate in elections from any location. Due

to the growing interest among voters, the Estonian Electronic Voting Committee was established in 2012, becoming responsible for organizing the elections. The State Electoral Commission remains responsible for overseeing the process.

Currently, to vote electronically, the voter must download a dedicated application (Valimised, N/A.) to their computer. Then, they must verify their identity, which can be done using the previously mentioned document with a microchip or a mobile document stored on their phone through a special app (mobiil-ID) or digi-ID, which is a form of document similar to an ID card. The main difference is that digi-ID can only be used online. It also contains less information than a regular ID and does not have the owner's photo. However, it retains all the functionalities of an ID for online use, allowing for verification and submission of a digital signature. A digi-ID can be obtained by a person who does not have the status of a permanent resident or citizen of Estonia. Therefore, the digi-ID provides individuals who wish to settle in Estonia with an easier way to handle official matters via computers. Additionally, during the voting process, the voter will need to enter a special PIN code, which they receive with their ID card. Each ID card contains three PIN codes: PIN1, PIN2, and PIN PUK. Each code serves a different purpose. PIN1 is mainly used to initiate procedures, such as verifying the person. PIN2 is used to complete procedures, typically for submitting a certified signature. The PIN PUK is a backup code, useful in case one of the previous codes is forgotten or entered incorrectly (Clarke & Tarvi, 2016). It must be acknowledged that the security measures in the Estonian system are very robust. After confirming their identity, the voter selects their candidate and submits their vote through another verification step. Until the online voting closes, the voter can check the status of their vote submission using the EH kontrollrakendus application (Valimised, N/A.).

One of the biggest criticisms raised about voting from home is the issue of the freedom to cast votes. Many people fear that some individuals may be coerced into voting for a specific candidate or that their vote may be cast without their knowledge and consent. Therefore, the authorities in Estonia conduct online voting from Monday to Saturday, while traditional voting with paper ballots takes place on Sunday at polling stations. Every citizen can change their vote multiple times on the website and can cancel it by going to the polling station on Sunday. Additionally, there is no electoral silence in Estonia, allowing elections to last for a week (Czakowski, 2011).

Currently, the Estonian government is working to enable voters to cast their votes through a mobile application. According to announcements, the app was

expected to be ready for the European Parliament elections in 2024. However, the authorities have not been able to fulfill this promise. Introducing the ability to vote via mobile phone would be another significant achievement for Estonians in the field of e-voting.

Results

The three countries presented in the article have chosen different methods of implementing e-voting in their elections. The example of Belgium shows that in countries with a small population, the costs of electronic voting in some forms can be significantly higher than traditional voting. However, the case of Estonia offers hope that every country will be able to introduce e-voting to at least some extent. The Estonian system is unique, and the lack of an election silence helps to spread voting over time and prevent issues such as system suspension due to too many login attempts.

Electronic voting is undoubtedly a hope for countries where infrastructure is not well-developed or where, due to weather events or even more common occurrences like a hospital stay, voters may have difficulty reaching polling stations to cast their votes traditionally. E-voting provides significant flexibility in this regard, which is important in a globalized society. In the case of Poland, electronic voting would facilitate municipal elections, as during these elections, citizens can only vote for candidates from the district where they currently reside or for candidates running in Warsaw if they want to vote from abroad. Thanks to online voting, every citizen could vote for candidates from their place of residence.

The issue of security regarding this type of voting raises doubts. This ranges from attempts at coercion to possible hacking attacks or tampering with results. Although some of these dangers can also occur with traditional voting, systems for preventing and punishing those who attempt to disrupt the electoral process have already been developed.

The solution implemented by the Estonian government does not fully address the problem in the context of striving for complete implementation of the third level of e-voting. It is important to note that this is a new solution, and as time progresses, with increasing interest and improvements in technology, new systems may emerge that will make electronic voting from home safe.

In many countries, there is currently a debate about e-voting, and some are using it on a small scale for local elections, like Switzerland, as mentioned by Musiał-Karg (2012). For this reason, we can be almost certain that more

countries will start implementing e-voting and e-democracy. However, it is difficult to predict which of the current methods will become the most popular. Despite the clear benefits of Estonia's e-voting system, no other country has adopted a similar approach. The Brazilian method is successfully used in its original or slightly modified form in several countries, but not on as large a scale as in Brazil. The Belgian system provides a safeguard in the form of paper ballots, so in the event of any malfunction, repeating the election would not be necessary.

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Belgia, Brazylia, Estonia – trzy wizje głosowania elektronicznego

STRESZCZENIE W tekście przeanalizowano rosnącą rolę technologii w demokracji, skupiając się na głosowaniu elektronicznym (e-voting). Wraz z rozwojem technologicznym różne dziedziny zaczęły stosować nowe rozwiązania, podobnie jak demokracja, którą w tym kontekście można określić jako e-demokrację, której integralną częścią jest e-voting. Pomimo wielu pozytywnych założeń głosowanie oparte na technologii, jako zjawisko stosunkowo nowe, jest często postrzegane jako nieznane, niepewne lub ryzykowne. Artykuł przedstawia rozwiązania przyjęte przez Belgię, Brazylię i Estonię. Kraje te znajdują się na różnych etapach rozwoju e-głosowania, przyjęły różne podejścia technologiczne i wyrażają różne poglądy na temat e-głosowania. Oprócz analizy samych metod e-głosowania uwzględniono również czynniki demograficzne i przepisy wyborcze. W rezultacie artykuł nie koncentruje się wyłącznie na rozwiązaniach technologicznych, ale pokazuje systemy e-głosowania w szerszej perspektywie.

SŁOWA KLUCZOWE Belgia, Brazylia, Estonia, głosowanie elektroniczne, e-voting, demokracja elektroniczna, e-demokracja

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