DEMOCRACY AT THE ONE-CLICK DISTANCE: IS ELECTRONIC VOTING THE BEST OPTION FOR MOLDOVA?

Ina Vîrtosu[1] and Ion Guceac[2]

Abstract

Electronic voting, known as e-voting, has become increasingly popular in our fast developing technology-driven world. Hence, the Republic of Moldova is a source country of migrants, a significant number of citizens reside abroad. Therefore in most of cases Moldovan citizens have to cast their vote in other countries when Moldova has to hold its elections. Presidential elections from 2016 showed that a poorly organized electing process could lead to violations of constitutional political rights. Hundreds of citizens that travelled a long journey to London, Bologna, Milano and other cities, where polling stations were located, were not able to cast their vote because election officials did not send enough ballot papers. For a country with a numerous Diaspora, e-voting could be a solution for all problems that Moldovans have related to the exercising of voting right. The process is seductively simple, but it is also shockingly vulnerable to different problems - from software failure to malicious hacking - and also requires some special conditions for its implementation. This paper aims to provide an insight into the issues of e-voting, and the debate of pros and cons surrounding it, in order to assess if this solution is the best way to go for Moldova.

1. Introduction

Nowadays many democracies are using or considering introducing electronic voting (e-voting) system with the intention to improve their electoral process. E-voting is often seen as a modern tool for advancing democracy that can increase the overall efficiency of the electoral process. Properly implemented, e-voting can eliminate certain inconveniencies for citizens, such as long distance from polling stations by improving accessibility, speeding up the processing of results, and even reducing the cost of elections/referendums in the long-term.

In May 2008 the Parliament of the Republic of Moldova approved the Law no. 101 on the State Automated Informational System „Elections" (SAISE) [24]. The long-term objective of the SAISE is to achieve full automatisation of the elections in the country. This includes the possibility to vote in any polling station, to vote through electronic voting machines, and/or possibility to vote via Internet. According to the Law No. 101, the e-voting system has to be developed, tested and piloted by the Moldovan authorities by 2018 Parliamentary Elections.

For the Republic of Moldova - a country with a numerous Diaspora - e-voting could be a solution for all problems related to the exercising of voting rights, however from other countries' past

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[1] Institute of Legal and Political Research of Academy of Sciences of Moldova, 1 Stefan cel Mare Bld., Chisinau, Republic of Moldova, ivirtosu3@gmail.com, http://icjp.asm.md/; University of Macau, Avenida da Universidade, Macau, yb67199@umac.mo, http://www.umac.mo/
[2] Academy of Sciences of Moldova, 1 Stefan cel Mare Bld., Chisinau, Republic of Moldova, ion.guceac@asm.md, http://asm.md/

experiences not all e-voting projects succeed in delivering on such high promises. An easy voting process that allows citizens to cast ballots the same way they buy items from Amazon, or punch in a PIN code to check out at the grocery store is not as simple as it looks. You could click on a candidate from a home computer or use a touch screen device at the local polling place; however, we have to understand that the current e-voting technologies are not problem-free. Particularly, in Moldova the decision of going paperless could face not just numerous legislative and technical challenges, but also other problems that raise a lot of scepticism, related to the process, or even social or political opposition to the introduction of new voting technologies.

Concerns related to e-voting are linked to the complexities of these electronic systems and procedures related to them [1]. Many e-voting solutions lack transparency for voters, and they are only completely understood by a small number of experts. In these circumstances, the integrity of the electoral process relies largely on a small group of system operators instead of thousands of poll workers. The process has to be carefully planned and designed; otherwise the introduction of e-voting can undermine confidence in the whole electoral process. Hence, it is of crucial importance to analyse all premises and circumstances, to devote adequate time and resources for considering correct e-voting implementation, and take into account other countries previous experiences.

E-voting is probably one of the most controversial methods of expression at the ballot boxes. If Estonia and Brazil consider it a system that works well and is acceptable for its citizens to express their constitutional rights, some countries, such as the Netherlands, Finland, France, and Germany believe that the use of online technology for voting is not safe and raises numerous constitutional problems, or uncertainty in the expression and quantification of votes. Norway even has dropped tests because of security hazards.[3]

All technology upgrades projects in the elections process require careful deliberation and planning [17]. Voting is a process at the heart of a democratic society, and represents the most responsible stage of the electoral process. It is the „outcome" of the entire electoral campaign, therefore introducing e-voting is probably the most difficult upgrade as this technology touches the core of the entire democratic process in the country - the casting and counting of the votes. This electoral option provides an opportunity for solving some old electoral problems, but also introduces a whole range of new concerns [17]. As a result, e-voting implementation always triggers criticism and opposition, being one of the most disputed information technology application in elections.

Our paper does not have intention to provide guidelines for the successful introduction of e-voting in the Republic of Moldova however presents some of the premises, concerns, and challenges related to this technology that have to be taken into account in the implementation process.

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[3] The Institute of Social Research in Norway conducted a study in which voters express their concerns related to the secrecy of their vote, which they see as a compromise of their democratic rights. In addition, voters' fears are embedded in the encryption system that guards the privacy of their votes, in special voters are not sure if their votes are safe from hackers.

2. Defining Internet Voting

E-voting systems have been in use since the 1960s,[4] with the first punched card systems. From then e-voting technology evolved and includes: a) voting using ballot papers, with special ballot boxes and scanning machines installed, so the ballot can be scanned before falling into the ballot box, or voting counting using handheld scanning devices (as „e-Pen" technology), used to digitally identify marks on the ballot papers; b) voting using dedicated electronic devices (voting kiosks); c) voting with transmission of ballots and votes via telephones, private computer networks, or Internet.

A Feasibility Study for the Internet Voting (Study) [34], conducted in Moldova for Central Electoral Commission (CEC) to evaluate the possibilities of introducing modern voting technologies in elections, culminate with the conclusion that the best e-voting solution for the country is the remote *Internet Voting Information System* (IVIS or i-Voting) that should be owned and managed by the CEC as a Module of the SAISE based on the *Reliable voters list* (SRV).

The current voting system is not adequate for Moldovan citizens living abroad, and there is a sufficient demand for the remote i-Voting which would facilitate voting process for Diaspora, since voters residing abroad won't benefit from other methods of e-voting, such as e-voting machines or ballot scanners.

In new democracies, Diaspora has a powerful and sound voice in the development of the country of origin. When it comes about Diaspora, different numbers are presented however according to the NEXUS data [7] currently there are approximately 700,000 Moldovan citizens residing or living abroad. Among them, more than 450,000 are long-term migrants (majority - labour migrants); over 100,000 are permanent migrants, and over 150,000 of Moldovans abroad are seasonal migrants. Majority of potential voters are residing in Italy, Russia, France, UK, Canada, USA, Spain, Portugal, Greece, Germany, Belgium, Turkey, and Israel [4].

To understand why this option was selected as the most optimal for Moldova we need to define and understand the concept of i-Voting.

Internet voting (i-Voting) refers to a voting method that transmits voted ballots via the Internet through a web browser or client application, accessed through an Internet connected personal computer, smartphone, or tablet [8]. Two main types of i-voting can be identified:

1. *On-site i-Voting,* which is physically supervised by representatives of governmental or independent electoral authorities, conducted at controlled settings (voting places or kiosks, established in high-traffic areas);

2. *Remote i-Voting*, without going to a polling station, and allows voters to transmit their voted ballot from any Internet connected device they have access (e.g. public/home/office computer, tablet, smartphone).

i-Voting greatly reduces direct human control and influence in this process, however on-site i-Voting allows electoral administrators to exercise greater control over the voting infrastructure used

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[4] Their first widespread use was in the USA where 7 counties switched to this method for the 1964 presidential election. The newer optical scan voting systems allow a computer to count a voter's mark on a ballot.

in the elections. At the same time remote option is particularly attractive as it does not require voters to go somewhere to vote, and thus potentially reduces costs and maximises the convenience for voters [8].

3. Is Moldova ready for Internet Voting?

According to the Study, remote voting via Internet is the best option as it may increase public trust in the public sector and government e-services, increase accessibility to vote for people with disabilities and limited mobility, reduce cost per voter, and most important to solve the problem of participation of Moldovan citizens living abroad [33]. The Study emphasizes that Moldova needs the following prerequisites for i-Voting implementation: necessary legal framework, social approval and demand, adequate technological maturity and political consensus.

3.1. Necessary legal framework

The legal framework needs to be reviewed to ensure fundamental rights and duties for democratic elections to be in line with international and regional commitments subscribed by the Republic of Moldova. These references might be interpreted differently in an e-voting context and require harmonization with the technology choice that the country wants to implement [17].

In the Republic of Moldova the creation of e-voting was assigned in the regulatory and legislative acts. However, there is no specific regulation of e-voting in the Constitution of the Republic of Moldova: Article 38 just mentions that the basic election principles must be ensured [5].

The Electoral Code had some modifications according to which starting from 2015 the State Register of Voters was implemented – a unique integrated information system of voters evidence, accomplished on the basis of the State Register of Population, drafted and approved by the law on the concept of SAISE, but does not include yet specific provisions regulating i-Voting concept, policies, voting secrecy assurance principles, voting procedure, rules, such as vote verification and cancellation, voter identification, and other characteristic components for this system. Also, there are no provisions on remote voting from an uncontrolled environment. In this context, the Electoral Code has to be modified by introducing i-Voting concept, procedure, including security and audit requirements, and other essential elements for this voting procedure.

Legal implications should go beyond the electoral law and fundamental obligations for democratic elections; it also has to cover parallel or subsequent legislation, such as digital identity, digital identification, digital signatures, data protection etc. In order to create a proper legal framework for the implementation of i-Voting, Moldova has already implemented some of necessary laws: Law on registers [22], Law on informatisation and State information resources [21], Law on electronic signature and electronic document [25], Law on personal data protection [24], Governmental Decision on the implementation of electronic identification document [12], Government Decision on the integrated electronic service for authentication and access control (MPass)[5] [13],

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[5] MPass or integrated electronic service for authentication and access control is defined as a reusable service, hosted on the Joint Governmental Technology Platform (MCloud), which aims to provide an integrated, secure and flexible mechanism for authenticating and controlling users' access to information systems, including electronic services.

Governmental Decision on the governmental integrated electronic service for electronic signature (MSign)[6][14] etc.

3.2. Social approval and demand

In 2012 Moldovan emigrants from 11 countries submitted a petition to the state authorities asking for the implementation of the e-voting procedure or correspondence voting, which, according to them, will make a major contribution to the growth of the number of voters outside the country and will allow Moldovan emigrants to exercise their constitutional right to vote [26]. The document was signed by 29 Diaspora associations, however the views of Moldovans appear to be divided in terms of modern methods of exercising the right to vote; some of them signed a petition on correspondence voting and did not agree with e-voting, others signed for e-voting as well. Those who did not sign for e-voting explained that many expatriates do not understand the process and are afraid of frauds.

Public trust is a very important element built on the socio-political context in which e-voting is introduced [17]. A negative social opinion creates serious risks, even if the e-voting technical and operational foundations are reliable and sound. Although, the government may ensure transparency and make available to voters all necessary documents, it will not be possible for everybody to understand an e-voting system. To have confidence in the electoral process, many voters rely on others who are in a position to understand the materials and processes. Social actors, such as non-governmental organizations (NGOs), information and communications technology (ICT) security expert groups (as well as other experts), and media, often have strong influence on public opinion, therefore these actors should be included at the early stage of the implementation of e-voting, by providing them with ample information about the system, that can be disseminated, and allowing them to clarify their own and citizens' concerns. It is important to hear and address their concerns by clarifying all misunderstandings, correcting weaknesses or accepting certain risks as a trade-off for the benefits of implementation of the new system. A supportive society could significantly help the introduction of e-voting and can temporarily even cover up problems that may occur in the detailed technical implementation.

In 2016 was conducted an on-line Survey[7] among the Moldovan Diaspora representatives on the introduction of i-Voting in the Republic of Moldova. The Survey revealed that at the 2016 Presidential elections 37% of the respondents did not participate just because the polling station was too far, 92.8% declared their support to the introduction of i-Voting, and 96.1% of supporters indicated that they would like to vote over Internet during the next elections. The Survey has proved that the current voting system is not adequate for Moldovan citizens living abroad, and there is a sufficient demand for the remote voting solution which would facilitate voting for the expatriates.

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[6] MSign or integrated electronic service for electronic signature is a reusable service, provided at the level of the Joint Governmental Technology Platform of the Government, which aims to provide a secure, flexible and flexible integrator mechanism for various solutions for the application and verification of the authenticity of the electronic signature by users provided by electronic signature providers in accordance with the legislation.

[7] The Survey was prepared and disseminated on April 2016 on Google Forms by the UNDP consultants mainly via the social networks with assistance from the Bureau for Relations with the Diaspora, Moldovan Government and UNDP Programme. The survey was addressed to Moldovan citizens living abroad and 914 citizens participated. Generally, the majority of the Internet users and consequently of the i-Voting supporters are aged between 25 and 45 years old (i.e. 71,2%) and between 18 and 25 years old (i.e. 19,4%). About 11% of the respondents indicated that they are older than 45 years.

3.3. Adequate technological maturity and necessary „infrastructure"

Choosing the right voting technology is essential as the technology needs to operate reliably within the available infrastructure, taking into account the prevailing environmental conditions. For the implementation of i-Voting, the Internet penetration, mobile network coverage, technical infrastructure, level of ICT literacy in the country, necessary quantity and quality of technology experts/managers with sufficient experience and competences are more than necessary. Even having all these prerequisites the ICT component should be implemented with a high level of transparency that generates broad stakeholder confidence.

According to the official data presented by the International Telecommunication Union (ITU) in 2016, 76% of the households in Moldova have access to the Internet, 75% - access the Internet at least once a day [18]. The penetration rate for the Internet service in 2017 is around 71% (over 2.87 million users) [19]. At the same time the mobile telephone penetration rate is 123% (over 4.44 million users. According to the statistical data presented by ANRCETI[8] on the three providers of mobile communications networks and services (Orange Moldova, Moldcell and Moldtelecom - Unite), the number of users who accessed the Internet based on 3G technology amounted to 1.622 million, with a penetration rate of broadband mobile Internet access services of 60% [2]. At the beginning of 2017, the 4G coverage rates of the territory and population of the Republic of Moldova were 94% and 97%, respectively [16]. The figures clearly show that Moldova has a high penetration rate of Internet and very good mobile coverage. Internet is also accessible almost everywhere in the country. Mobile phones, tablets and computers can be found in the majority of households.

In 2014 in Moldova was launched the electronic identity card of the citizen (E-ID card)[9] [12] that allows the practical accomplishment of the e-voting system. The identity card with incorporated electronic chip and digital signature as a unique electronic identification and authentication device will allow the e-voting via Internet (but also can be used at the voting machines which will be installed at the polling sections), regardless of the voter's location. The document is also integrated with the e-Government solutions, MPass and MSign platforms, and allows drawing up legal documents in electronic format, to access information from the informational systems and resources, the processing of the public and private electronic services, and financial transactions accomplishment.

As a newly launched product it is obvious that not many citizens have E-ID. Moreover the cost of this document is five times higher than the cost of a simple identity document.[10] Therefore for the purposes of i-Voting in Moldova, it is advised to use several different methods of voter authentication, such as MPass service using mobile signature/ E-ID cards/digital certificates, or a special login credential (a pair of login passwords), generated and delivered for the voter on a dedicated subpage within a CEC website

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[8] National Regulatory Agency for Electronic Communications and Information Technology of the Republic of Moldova
[9] The model of the electronic identity card of the citizen (E-ID card) can be seen on official page of public institution „Public Services Agency", http://www.registru.md/en/node/3337. The service can be ordered online on http://e-services.md/?q=ro/content/buletin-de-identitate-electronic.
[10] The price of the electronic identity card produced during 30 days is 700 lei (around 34 euro), and the price of the identity card – 130 lei (around 6.4 euro).

3.4. Political consensus

The introduction of new voting mechanisms requires changes in the legislation, therefore consensus and sustained multiparty political acceptance is a mandatory ingredient. E-voting systems can be most easily introduced when there is a long-term support of the majority of political parties. In the opinion of some experts, some political actors may oppose e-voting for many different reasons, either because they have real technical concerns, or they fear that the new voting channel is an advantage for their political opponents, or just because they do not have confidence in the independence of those implementing the system [11,17]. Parliamentary political parties expressed a general support for the introduction of i-Voting in Moldova. Members of Parliament mentioned that i-Voting could be an alternative voting solutions for citizens living abroad, young electorate whose participation rate in the elections is very low, and for those who usually are not able to vote due to other agendas during the Sunday Election Day [34].

4. Strengths and Weaknesses associated with Internet Voting

The discussions about e-Voting are very arduous and contradictory; debates among scholars, politicians and experts, revolving mainly around pro and cons of the implementation of this project. As i-Voting more directly affects two large groups - the voters and the government - in order for i-Voting to be instituted, it must be a significant advantage, much greater than the costs for both of these groups.

4.1. Why Internet Voting should be implemented?

We can mention the following strengths associated with e-voting: a) potentially increased participation and turnout, particularly with the use of i-Voting[11]; b) increased convenience and accessibility for voters, being more attuned to the needs of an increasingly mobile society, especially increasing the ease of voting for citizens who are geographically isolated from election centres; c) efficient handling of complicated electoral systems formulae, subsequently faster vote count and tabulation [17]; d) possibility of multilingual user interfaces that can serve a multilingual electorate better than paper ballots, especially in case of the multicultural society of the Republic of Moldova; e) increasing accessibility to vote among people with disabilities and those with limited mobility; f) more accurate results as human errors are excluded; g) long-term cost savings (in poll worker time, reduced costs for the production and distribution of ballot papers, reduction of spoilt ballot papers as voting systems can warn voters about any invalid votes, global reach with very little logistical support, no shipment costs, no delays in sending out material and receiving it back etc.); h) reduced number of incidences of vote-selling and family voting by allowing multiple voting where only the last vote counts, and prevention of fraud in polling stations during the transmission and tabulation of results by reducing human intervention.[12]

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[11] Estonia has seen positive movement in turnout since the introduction of Internet voting. Prior to the introduction of Internet voting, 58.24 % of voters participated in the 2003 parliamentary election. After the introduction of Internet voting in 2007, turnout increased to 61.9 %, and again to 63.5 % of voters in elections held in 2011.
[12] The system must generate cryptographic verification proofs (e.g. voting receipts). Indeed the price of one bona fide, for registered Moldovan vote varies from place to place, however the last years' elections show that election frauds require extensive efforts against illegal voters, election-fraud cases more often involve citizens who sell their votes, usually remarkably cheaply at 100 MDL and at the high end, corrupt candidates who use money, goods and influence to get more votes.

i-Voting can reduce this common practice and serious issue for Moldovan elections, such as practice of buying voters, blocking the electoral process through lack of ballots, electoral tourism – all attested even for the last Presidential elections. As a result, elections were followed by protests in the Republic of Moldova, Romania, and other European countries, demanding the recount of votes and even a third round of elections.

4.2. The challenges of i-Voting implementation

Besides strengths and positive sides of i-Voting implementations we should also take in account a range of shortcomings as i-Voting faces a wide variety of potential attackers beyond those encountered in traditional elections and these include: insider attacks from system administrators, cybercriminals working for dishonest candidates, so-called „hacktivists" seeking to disrupt elections, and even nation-states applying offensive cyberwarfare capabilities [31]. Alex Halderman emphasizes that practically in every case where a fielded e-voting system has been publicly scrutinized by the capable independent security experts, it has been proved in the end to have serious vulnerabilities with the potential to disrupt elections, compromise results, or expose voters' secret ballots [15]. Technology adds more steps to the process, and in the same time increases the possibility of errors with each additional step, most of them are largely unseen by the voter [3]. We will not go into details to analyze all shortcomings of software engineering issues, such as code legacy, coding style, coding process, or code completeness and correctness, cyberwarfare capabilities, however we will summarize and describe general weaknesses associated with i-Voting.

4.2.1. Limited openness and understanding of the system for non-experts

Although nowadays modern technologies are widely applied in the realm of science, trade, business, or administration, when it comes to the implementation of IT technologies into voting processes, not just simple citizens, but even politicians, some experts, and scientists are still dubious [28].

4.2.2. Lack of transparency

The confidence in fair electoral process is based on the premises that all aspects of the elections process are directly observable [10] by the candidates, official observers, and people themselves; however in the remote i-Voting this is not the case. In fact, the voters, candidates and even officials do not really know how the voting system and software operates, and only a small group of specialists (such as system administrators) and other experts have the notion of the technical aspects of voting and manner of vote counting. Democracy functions well when the electorate has confidence that their vote matters.

Transparency has been a source of controversies, and core consideration since i-Voting inception. Fortunately, in 2004 the Committee of Ministers of the Council of Europe adopted Recommendation Rec (2004)11 on legal, operational and technical standards for e-voting, providing concrete guidelines that clarifies the issues related to the transparency [31]. In 2017 these standards were updated by Recommendation CM/Rec (2017)5, to ensure that electronic voting complies with principles of democratic elections in the context of present challenges and are the only existing international standards on e-voting so far [32].

Recommendation CM/Rec (2017)5 provides that the state shall be transparent in all aspect of e-voting [32]. This standard implies that the competent electoral authorities shall publish an official

list of the software used in an e-election (or at the very least it should indicate the software that will be used, the version, date of installation and a brief description). Also, it is recommended that voters should have access „well in advance"[13] of the election period to the components of the e-voting system and relevant information, in particular to documentation, source code and non-disclosure agreements [32]. Some experts consider as a good practice to publish code with a license restricting its use to code inspection or testing, providing transparency to i-Voting process [34], however it is worth understanding that code publication does not provide a guarantee of the security of the system, therefore is a trade off of security for transparency.

Voters are familiar with traditional voting methods that are well tried and tested, however a new voting system may cause concerns of different kinds. In order to promote understanding and confidence in any new i-Voting system, including in its transparency, voters shall be informed in clear and simple language, about: a) any steps a voter may have to take in order to participate and vote; b) the correct use and functioning of an e-voting system; c) the e-voting timetable, including all stages [31,32]. It is very important for voters, especially for those who are not familiar with i-Voting system and for elders, to have opportunity to practice the moment of casting their vote.

Auditing, observation, and monitoring of the election process not only enhance transparency, but also provide additional confidence for voters. Assessment that i-Voting systems function correctly and the security is provided is essential, therefore the system as a whole shall be disclosed for an independent evaluation and certification purposes [32]. The electorate must have the confidence that the election process is fair and the process is transparent, the system software must be open for inspection and the „design, implementation, development practice, operational procedures, and testing procedures must all be unambiguously and consistently documented" [3].

4.2.3. Risk of manipulation by insiders with privileged access to the system

One of the most important aspects of system security is the personnel who will use it. Much effort is invested in securing the system from external threats, as the developers and administrators of the system are often assumed to be harmless [3]. However, it should not be excluded the possibility of fraud through large-scale manipulation by a small group of insiders. In the opinion of Newman more often than not, the truly damaging attacks come from within [29]. Therefore the people involved in developing, operating, and administering i-Voting systems must be of unquestioned integrity.

4.2.4. Malicious Software Programming

The risk that programmers will try to rig elections through misleading software has led to specific processes and policies to avoid such deceptive event. Software code passes through numerous internal and external checks, including rigorous certification testing by independent certification bodies before use in an actual election [6].

Some experts consider that because the voting system software is engineered months in advance of actual elections, it is very unlikely for programmers to know the candidates for elections and to

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[13] The expression „well in advance" is defined in the Guidelines for the implementation of transparency and observation recommendations as clear time frames that are set in national regulations for such disclosure and that the planned deadlines allow stakeholders to exercise their rights, react to such disclosures, and request changes. In order to respect the "well in advance" criteria, experts recommend twelve months before the Election Day for disclosure of information.

know how their names will appear on the ballots [1, 3]. However we can claim that testing e-voting systems for different security problems, especially if they were intentionally introduced and concealed, is basically impossible. Thus there is a high possibility to insert by programmers obscure combinations of commands and keystrokes that will slip through quality assurance testing. A double or even triple checking is never unnecessary. Also, it could be a possibility that voter's personal computers are virus/malware-infected which, in turn, can result in distorting the vote decision or/and affect the whole system of i-Voting.

4.2.5. Vulnerability to hacking

If there is no external communications pathway, then there is no risk of hacking, or gaining unauthorized entry into the system, however all the processes, including transmission of the election results, are performed via the Internet. An attacker who strikes early enough can introduce malicious code into the counting server by using a chain of infections that parallels the configuration process [15], especially if encryption and verification are not sufficient. It is reasonable to assume that the systems will be exposed to higher numbers of attempted attacks and manipulation as the use of e-voting becomes more widespread.

For some scholars i-Voting is a gamble with democracy, as there is not enough confidence in cyber security. An independent evaluation of e-Voting system in Estonia shows how shockingly easy it can be hacked and defrauded [33]. Evaluation was based on election observation, code review, and laboratory testing, and revealed staggering gaps in procedural and operational security. It was proved that the system architecture that leaves it opened to cyberattacks from foreign powers could alter votes or leave election outcomes in dispute. Experts confirmed that results were so alarming that they urgently recommend that Estonia discontinue use of the system [33]. We should not forget that Moldova is also situated as Estonia in the area of Russian interest; therefore it is a high possibility of hacking as was in the case of Estonia in 2007. Experts consider that attacks on i-Voting systems can be launched by anyone in the world, and in many cases may be successful while remaining completely undetected, consequently, this type of voting, in general, cannot be made completely secured for use in real elections for the foreseeable future [20]. The attack could be operated by a foreign country, candidate or party who wants to win the election at any cost, or even a hacker who just wants to prove his skills by disrupting the elections.

The threats on i-Voting security could be diverse and mainly refers to: a) denial of service, when hackers may compromise the availability to a voting system, such as „Ping of Death" or „Packet Flooding"; b) viruses aiming at destroying e-voting systems; c) worms that are viruses that do not change any existing program or file to spread itself; d) Trojan horses, that can delete or modify important files from the computer, by planting a harmful virus, or even stealing user's passwords etc.[1]

4.2.6. Increased infrastructure and environmental requirements

The Republic of Moldova consolidates its position in international rankings regarding the speed of the Internet. According to the study of Netindex, Moldova is on the 6th place at download and upload speed with 40.6 Mbps and 60 Mbps [27]. The country ranks 3rd in the world by gigabit coverage with around 90% of the population having the option to subscribe to a gigabit plan [27]. However we need to take into account issues related to constant power supply, communication technology, the possibility of system attack or breakdown, or connection failure, for instance in case of bad meteorological conditions or accidents.

4.2.7. Danger of interference in uncontrolled environment

E-voting in uncontrolled environments happens without any supervision and cannot be controlled by the election administration. This can be done from home, on the voter's personal computer, or potentially anywhere on mobile or public devices. With voting in uncontrolled environments, concerns regarding the danger of interference by someone else in proximity to a voter (at home or work) in order to control the voting decisions could be really high. Family voting, intimidation, vote-buying, fraud, forcing to vote selling, as well as the technical integrity of the device from which the votes are cast, all need specific consideration. Current forms of i-Voting have not yet been able to provide a definitive solution to such concerns.

4.2.8. „Digital divided" society

In opinion of some experts remote i-Voting has potential for a „digital divide" society, which can occur in two ways [10]. First case is a digital divide between those who have home computers with Internet connections and those who do not. Second situation is a gap between those who have faster access and those who have slower connections, hence lower quality access. In Moldova access is often less expensive and of higher quality in urban areas as customers can choose between a range of Internet providers, but those from urban area have mainly one choice – Moldtelecom – a national company. Those with lower income and who live in rural areas are at a disadvantage if they cannot afford it. Also, seniors in Moldova have very low rates of technology adoption than the general public; this group is more digitally disconnected than others and also mainly because of the low income. Therefore the extension of i-Voting has the potential to result in emerging of a „digital gap"[30], to create divides with respect to many socioeconomic variables, such as income, age, education, gender, geography etc.

4.2.9. The need for additional voter education campaigns

Implementation of i-Voting requires a voter education campaign to ensure that the public is aware that i-Voting is an option, and voters are able to understand and use the on-line system to cast a ballot. It is recommended to prepare a series of educational videos and make them available on social networks to explain what i-Voting is, how it works, and its benefits. Without correct marketing and advertising it will be difficult to engage electors.

The lack of adequate voters' technical skills to use the remote i-Voting could be also a problem, thus an additional campaign has to be organized for citizens who have never used a computer before, or did not have opportunity to use it frequently, such as low income citizens or seniors. Still, there is a notable digital divide between younger and older Moldovans, as many seniors, less affluent or with lower levels of educational attainment continue to have a distant relationship with digital technology.

5. Conclusions

Electoral authorities and the Parliament of the Republic of Moldova are in the process to adjust the legal and regulatory framework to allow the implementation of i-Voting system. A non-binding i-Voting Pilot will be conducted on a pre-selected group of voters within the country and from the Diaspora at the parliamentary elections in 2018. The Pilot should offer all technical, operational, and security features, as if it is used for legally binding elections (except the legal validity of the results is

not checked), and aim not only to test the security and reliability of the system, but also to gather valuable feedback from experts and society.

Taking into account all circumstances, such as legal environment, demographic situation, ICT development, social demand and political consensus, we can conclude that Moldova is ready to implement e-voting (i-Voting) system. However a range of potential shortcomings analyzed in the paper points very clearly that i-Voting cannot be offered as an exclusive voting method, but as an auxiliary voting channel to the traditional voting system. Hence, it remains essential that voters are given the possibility to participate using traditional methods. In this context, it is advised for a step-by-step approach to i-Voting process, with necessary trials and gradual implementation of the system. As a dimension of e-government or e-democracy, i-Voting can be seen as a critical infrastructure of a democratic polity.

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