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# DEVELOPING OF THE E-GOVERNMENT SYSTEM BASED ON JAVA FOR ONLINE VOTING

*Системи електронного уряду призначені для поліпшення рівня взаємодії уряду з громадськістю та поліпшення доступу до послуг, які надає уряд громадськості. Запропоновано систему електронного уряду на базі Java, яка дозволить уряду проводити онлайн-голосування. Це буде гарантувати, що люди голосують в зручних для них місці і час, не турбуючись про крадіжку свого голосу і конфіденційної інформації.*

**Ключові слова:** система електронного уряду на базі Java, онлайн-голосування, крадіжка конфіденційної інформації.

## 1. Introduction

The current paper is concerned with understanding the various aspects of e-government system. In addition, a new e-government system has been proposed that is likely to support the government in handling the election polling. E-government system refers to the use of electronic mediums to facilitate the services to the public of the country [1].

The e-government system allows the citizen to engage with the government at all the levels and along with gaining benefit from the actions of the government, it contributes to the action of the government. With the use of e-government system, the citizens involve in the local and national governance. The information and communication technology is used to facilitate these actions. As per United Nations, the e-government is referred to as the actions of the government that lead to the use of information technology to facilitate the delivery of government services to the citizens [2].

At present, the United Nations conducts e-government survey twice a year to assess the readiness of the governments of different countries regarding the use of information and technology to conduct their business and cater to the masses. As a model, the e-government system should be able to allow any individual visiting the city or country website to engage in communication with the employees of the local government using the Internet, GUI, and IM.

The current paper is concerned with understanding the current e-government system and proposing an additional system that can aid in the current system. The current e-government system is assessed and then an additional online system is proposed. Also, the potential merits and limitations of the proposed online system are identified.

## 2. The object of research and its technological audit

*The object of research* is e-government system.

At present, due to the technological advancement, almost every household has the access to the technology. This allows the government to implement technology based solutions that can help in making the lives of the people

simpler. At present, it has been found that the people are required to stand in the line to vote for their respective candidates. This leads to the challenging situation for government and the public as well. On one hand where the government is required to make improved management of the voting, on the other the public are required to get away from their daily course and stand in the line to vote. There is a necessity that a system is brought in the picture that can resolve this challenge. Interestingly, due to the increased adoption of technological devices by the public in the past decades, the implementation of online system has become easier for the government, as long as it is suitable and useful for all the concerned stakeholders.

## 3. The aim and objectives of research

*The aim of research* is to come up with a suitable e-government system that can assist the government in improve its voting.

The objectives of the research are:

1. To understand the existing solutions available for voting.
2. To propose a new e-government voting system.

## 4. Research of existing solutions of the problem

One can witness numerous researches that have been conducted regarding the usage of technologies to facilitate in the elections [3–6]. Some of these studies have warned against the rapid adaptation of the technology as it can be challenging for the stakeholders to get used to it. However, with the improved security measures, the technologies can be a beneficial tool. The elections conducted in various countries uses technologies in different way. As for instance, the election conducted in Florida (United States) in 2000 used punch card voting system which was later adopted by wide population. This new electronic voting system allows the voters to have a government issued token or smartcard which they can take to the nearest voting terminal in their locality and then swipe the card. The system also allows them to make any changes if they want by entering pin. This has been

considered appreciable in comparison to the traditional method where the voters approach the voting booth to cast their vote by first showing their voter id and proving who they are. On the other hand, the direct recording electronic (DRE) voting system allows the users to have quick voting experience with faster service. There are only few instances of adoption of this system, as there are still countries where the method of voting is traditional and cumbersome [7–9]. Here, it can be stated that despite the DRE, the government are required to make arrangements for the voting terminals. However, the goal should be to ensure that the voters do not need to leave their home to vote and can vote from their comfort zone. This should be filled as it will reduce the interruption for public who can vote from their comfort.

One of the important aspects to understand here is that the parties in the election can get the benefit of the system if they identify any loopholes to utilize the system flaw. The recent development has found that the governments of few countries have adopted the usage of the DRE without considering or questioning the security of the system which can be a fatal mistake. Here, it is necessary that a voting system that is robust and secure is required to be developed the introduction of end to end encryption can also improve the security of the system. The end to end encryption has become a necessary tool for the current systems due to the increasing security threats [10–12].

## 5. Methods of research

The method of research used for the current paper is secondary. The researcher referred to various secondary resources for the collection of the information that were relevant to the study. The secondary research allows desk-based study of the required research area. The study could have been taken further by conducting primary research to gain more input for the required system, however due to the time constraint, secondary research was preferred.

## 6. Research results

The current chapter assesses the current e-governance system keeping in view the current position of various countries such as United States, United Kingdom, and India. In general, there are four models of service delivery from the government. They are from a government to the citizens, from a government to businesses operating in the country, from one department of government to another, and from the government to its employees.

The adoption rate of e-government system is different in the different parts of the world. The developed economies such as The United States and The United Kingdom have an appreciable rate of adoption in comparison to developing nations like India. The developed nations also witnesses improved usage rate of the system by the citizens whereas same can be found far below in the developing nations [13].

The improved usage of e-government system requires that the citizens of the country are well aware of modern information and communication technology and how to use them. If a government is willing to use the e-government system, then it is important that an education drive should be facilitated that can educate the citizens about

the same. This will help them get the intended benefit from the system.

The governments can use the information and communication technologies to improve their governance capability. The IT can be implemented in almost all aspects of the government activities and all can be coordinated together to provide better service to the masses. Also, Internet can help the government in establishing better coordination among the departments and improving the internal and external relations.

In general, when the discussion of e-government comes up, people think about the Internet which is appreciable as it is the only thing at present that should be guiding all the technological adoption by the government. However, there also exists e-government which is not based on the Internet. The use of SMS, telephone, wireless networks, smart cards, CCTV, and others are also on the premise of information and technology and thus are also the integral part of the e-government system. However, the definition of the e-government has not changed to something that allows inclusion of citizens with the government and this can only be facilitated by the use of the Internet [14].

One of the important things, however, to consider is that the use of e-government system is different in various countries and it impacts the level of equality. The countries, where fewer people are aware of the Internet and technology, such as India face a lack of equality. On one hand where the citizens who are aware of IT, gains the benefit from the improved government communication, however, the other part of the citizens who are still unaware of this aspect face challenge.

There are many such people who are homeless, have lower income and cannot learn or purchase IT devices, or are living in the remotest of the locations where there is no IT infrastructure. In such scenarios, it is difficult for the government to provide benefit to these people directly with the use of e-government modules. Here, the elementary step of the government would be to train these people about the new technology and install right infrastructure [15].

In addition to above, it is important that the citizens trust the e-government model for whether it will perform as expected. Interestingly, the e-government system is still in developing phase from the most developed economies to the underdeveloped economies. Even countries like US and UK has not fully adopted e-government mechanism due to various reasons.

**6.1. Proposed E-Government System.** The e-government system consists of various modules and infrastructures that cater to different aspects of government functioning. The current chapter will propose a new module to the current e-government system that is likely to assist the government in getting more digitalized.

The proposed system is an online voting system for the elections. This system is still in a debate that whether a government should adopt this method of voting considering various challenges, such as identity manipulation, data theft, and others.

The system that has been suggested is Java based system which will allow the government to hold voting at the local or national level. The citizens will use this system to enter their personal details and then cast their vote for their preferred candidate. Fig. 1 shows the information that will be entered by the users before they engage in voting.

**Fig. 1.** Voter Registration Process

The information will be stored in the government database and will not be shared with any third party. The current system will store a name of the voter, his unique voterID, password, phone number of the voter, address of the voter, date of birth, and nationality. The aforementioned information will be used to identify particular voters when they will cast their vote.

The registration will generate unique username and password that will be used by the voter to log in to the system using the window on Fig. 2.

**Fig. 2.** User Login Window

When users will enter their name (username) and password, then the system will take them to the voting page where the users will see the list of candidates who prefer to be elected in the particular election. The users will select a particular candidate and submit their vote.

The system will ask for the confirmation from the users regarding their vote and the voting will be completed. The users can then log out of the system after casting their vote. This will be the whole procedure of the new online voting system from the users' (voters) end.

In addition to the above, the new system will also allow the admin to view the votes cast in a graphical manner. This will allow easy viewing of the votes. The system will allow the admin to view the data in three human readable formats for the total casted votes. The first will be a summary of the votes cast in the form of a table. The sample is shown in Fig. 3.

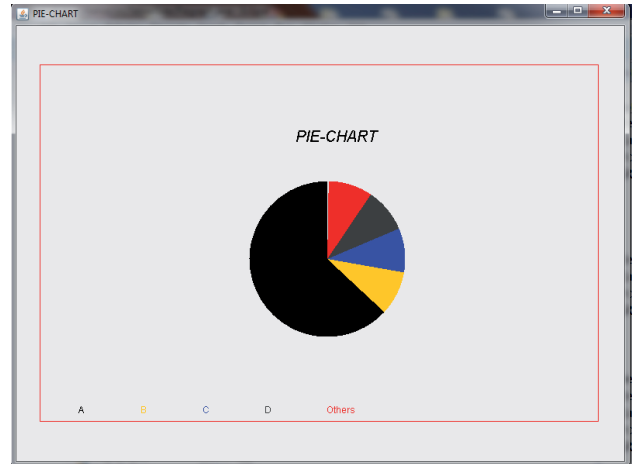
Here, the admin will be able to view the parties for whom the vote was cast, a total number of votes cast for each of the parties, and the same value in the form of the percentage. This will allow the admin to understand

the winner and the loser. Another format that will be used to show the data is pie chart and the bar chart.

PARTIES	VOTES	PERCENTAGES
A	170	7.906976744186046
B	270	12.558139534883722
C	370	17.209302325581397
D	470	21.86046511627907
Others	870	40.46511627906977

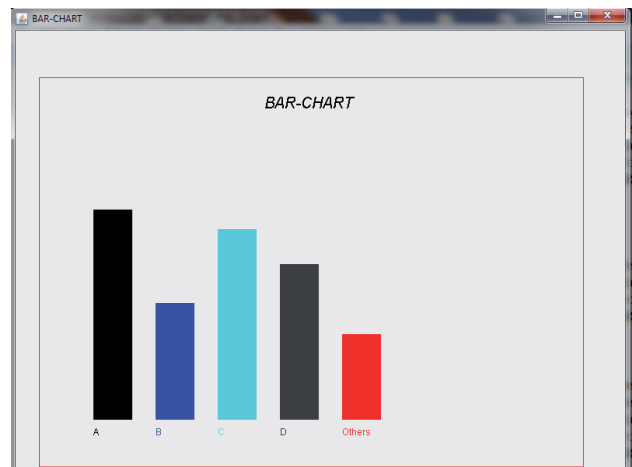
**Fig. 3.** Voter Results Summary

The snapshot of pie chart generated from the sample data is given in Fig. 4.



**Fig. 4.** Voter Result Summary in Pie Chart

Here, in the above pie chart, the admin can visually understand the party to whom the maximum number of votes has been cast. Fig. 5 shows the same data in the form of bar graph.



**Fig. 5.** Voter Result Summary in Bar Graph

Here, the bar graph above shows the total votes cast to the different parties. The size of the bar graph will show which candidate has won or lost.

These visuals will help the system admin in knowing about the winners and the losers. The Appendix 1 shows the Java codes utilized to facilitate the development of this system. The codes are substantial in size and, therefore, only certain aspects of them are shown under different headings.

**6.2. Benefits of Proposed E-Government System.** The proposed system will allow the government to get votes from the citizens without arranging booths to cast their vote. This will significantly reduce the cost incurred in conducting voting across the country every few years. Moreover, this system will allow the voters to cast their vote any time of the day they want and that too without lining up at the voting booths.

The secure login id of the voters will be used by them to log into the system and cast their vote as per their desire and comfort level. The new system will securely transfer all the votes to the central database instantly with the help of end to end encryption.

**6.3. Limitations of Proposed E-Government System.** The new system is still in the development stage and there are various aspects that are required to be developed to make it more robust and usable to the government. The current system is less secure and usable to the government and the public.

There are also some demerits to the current system. The use of current system requires that the voters know how to cast their votes through this system. In addition to this, there are other prerequisites such as the users should be able to operate computers, access Internet, open browser, and establish the connection.

**6.4. Software and Hardware for the System.** The current system has been developed for the users who will be voting for the selection of candidates during the time of election. This system will allow them to vote from their desktop or laptop in their homes. The users have to download this program on their laptop or desktop. The system will then connect securely with the government server using the end to end encryption and the voting will complete. This process has been considered to make the voting more secure. The system will record IP address from where the voting is done.

As per the hardware of the system is concerned, the system should be running Windows Operating System version 7, 8, or, 10 (Table 1).

**Table 1**

The hardware and software requirement for the current system, that was modernise in this research

Minimum Requirements	
Operating System	Windows Version 7, 8, and 10
Other Program	Java Software from Oracle
Intel CPU	Core 2 Duo E6600 2.4 GHz
Or AMD CPU	Athlon X2 7750
RAM	1 GB
HDD Space	500 Mb

Also, the system should have Java software installed to support the running of this new system.

**6.5. Principle of Operation of Algorithms of the System.**

The current system will be installed in the computer of the users as normal software. The system will have access to MAC address of the computer and the IP. The system will open in a dedicated window which consists of user login and password. The system will first establish secure connection over the Internet to the server. The entry of the data from the user to access the system will initiate the verification process and it will be approved in the back end. The approval process will also have one time password (OTP) usage which will be sent to the users' phone. The process will be taken further with the voting. The second screen will have list of candidates and option to cast votes. The casting of votes will be allowed for 100 seconds. After that, the system will close automatically. Whether the voter has casted their vote or not, the system will close on its own after 100 seconds. The users can login again to cast their votes if they did not.

**7. SWOT analysis of research results**

*Strengths.* The essence of the scientific results obtained by the current development is that the new system helps in understanding the dynamics that are considered while developing the system that is to be used for the public purposes in midst of various internal and external challenges. The development of the system required that not only the basic purpose of the system should be achieved, but it should be also considered that the new system is secure on end to end. The system development should be conducted considering the need of the users while taking care of their privacy issues.

The current system will allow the government to conduct online elections. It will be easier for the government to conduct the election without engaging extra resources. The system will allow the voters to vote securely with end to end encryption.

*Weaknesses.* The current system is in its development stage and the implementation of the system will require robust security measures and it is a mission critical system and can attract external challenges. The system should not allow way to any other unintended activities except for what it has been built for.

*Opportunities.* The current system will be hugely useful for the governments in conducting voting in various locations around the country. The new system will likely open opportunities in other governmental department at smaller to larger scale to conduct the voting. It can also be used by the public limited companies to conduct shareholder voting to select the next chairman for the organization.

*Threats.* The threats are in the form of hackers who might try to infiltrate the system to steal the voter data.

**8. Conclusion**

1. The use of e-government system is likely to improve if the governments of various countries make effort to educate their population. The use of e-government system will help in the easy management of most of the governmental activities and also facilitate the successful interaction with the citizens.

2. The current article proposes an online voting system that is expected to be used by the government to

conducting voting. The voters will cast votes by logging into the system which will be then summarized by the system automatically in the form of a table, pie chart and bar chart to know the result of the election.

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### ИССЛЕДОВАНИЕ СИСТЕМЫ ЭЛЕКТРОННОГО ПРАВИТЕЛЬСТВА НА БАЗЕ JAVA ДЛЯ ПРОВЕДЕНИЯ ОНЛАЙН-ГОЛОСОВАНИЯ

Системы электронного правительства предназначены для улучшения уровня взаимодействия правительства с общественностью и улучшения доступа к услугам, которые предоставляет правительство общественности. Предложена система электронного правительства на базе Java, которая позволит правительству проводить онлайн-голосование. Это будет гарантировать, что люди голосуют в удобном для них месте и времени, не беспокоясь о краже своего голоса и конфиденциальной информации.

**Ключевые слова:** система электронного правительства на базе Java, онлайн-голосование, кража конфиденциальной информации.

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## APPLICATION OF THE HOMEOSTATIC APPROACH TO THE FORMATION OF THE PORTFOLIO OF REGIONAL DEVELOPMENT PROJECTS

*Визначені ключові групи зацікавлених сторін портфельів проектів розвитку регіонів. Розглянуті основні цілі розвитку регіону з точки зору ключових груп зацікавлених сторін. Описаний підхід до формування загальної множини цінностей зацікавлених сторін проектів розвитку регіону. Запропонований підхід до формування портфельів проектів розвитку регіону та підхід до вибору інструментів моніторингу процесу реалізації портфелю таких проектів.*

**Ключові слова:** управління проектами, управління портфелем проектів, гомеостатичний підхід, проекти розвитку регіонів.

### 1. Introduction

Evolutionary processes in the world economy have led to the fact that the existing commodity economy

is gradually evolving into a knowledge economy. The economy of regions and entire states varies under the influence of a number of independent factors. The key of these factors can be considered the opening of bor-