

Elections and IT; the challenge of making it work in a changed world

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Abstract. In this chapter, the reader is informed about the latest developments in securing the integrity of the election outcomes in the Netherlands, and especially about the uses of the software that supports the election process. It is argued that there should be more international cooperation in safeguarding the integrity of the election process.

Keywords: Elections, Politics, Information technology

1 Introduction

Most people associate the use of digital means in the election process with voting devices or internet voting. Yet there is so much more, but this gets little or no attention. During the last two years the use of software to support the voting process became, quite unexpected, a major issue in the Netherlands. In the case of the national elections, in the spring of 2017, this almost led to a major crisis.[1] In 2018, there were municipal elections, and once again, there were problems. In this article, we first will inform the readers about the new challenges that emerged during these local elections.

As there are discussions about the use of software in the election process for two years in a row now, this suggests that we are dealing with a structural problem. Our second purpose in this article is to describe the underlying problems and to stimulate the, in our opinion much neglected, attention for the use of software which supports the paper-based approach in the election process.

2 The Dutch case in general

Countries differ in the ways they arrive at election results. In the first place, this is the consequence of differing electoral systems, of course. There are also differences arising from other structures and from the collaboration of bodies charged with the responsibility for the result. There are also differences among the logistical processes that establish the results. One important element of those logistical processes is the degree to which digital resources are used to establish the result. As most countries still count the votes manually, many, at least partly, also rely on digital processes and the use of software to aggregate votes.

In the Netherlands, the election process has had considerable public interest in the past years. Some fifteen years ago, it appeared that the use of voting machines would become the standard. After the year 2000 more and more municipalities started to use electronic voting devices. Yet, after 2006 it was established that using these devices resulted in an insufficient level of transparency regarding the outcome of the elections. They were therefore abolished.[2]

So, in the Netherlands, all votes are cast on paper in elections by coloring the preferential candidate's box red. Immediately after the polling stations' closing time, at 9 PM, all paper ballots are counted manually at the polling station itself. The result is recorded in an official report. The chairperson delivers this official paper report in person from the polling station to the municipality that very same night. All the official reports are collected and counted at the town hall – often deep into the night – so that the result of an election is known at the municipal level.

When it comes to national elections, the municipal results are delivered on paper to the Electoral Council after an administrative process that takes a few days; the Electoral Council then establishes the results. It has been known for many years that the logistical challenges associated with this paper process demands a considerable amount of work from those involved. As mentioned, it takes a lot of time. Furthermore, the process in which results are handed over on documents filled in by hand can lead to several errors. It is clear that the paper process and the manual count have vulnerabilities. In the national elections of 2017 there occurred an incident that led to the loss of some ten thousand votes. This incident was described in a previous contribution for the Bregenz Conference in 2017.[3] So, despite the best intentions and extensive instruction, errors are made with the manual counting and the subsequent transfer of results into official reports

In the Netherlands, many of the logistical challenges associated with the elections are the responsibility of the municipalities in the first instance. Since the reintroduction (after 2006) of the traditional paper-based approach of voting, most municipal employees have stayed strong advocates of digitization of the election process. After struggling with the 'paper process' for more than ten years after the abolishment of voting devices several interest groups from municipalities sounded the alarm and drew up an Election Agenda with a list of priorities that they feel must be implemented by 2021. One of the desires high on this agenda is electronic ballot-counting. There is also a plea for electronic voting. In this, municipal representatives emphasize primarily the need for speed and a more efficient process. Various interest groups of municipal representatives emphasize that technology presents opportunities for a faster and easier voting and results tabulation. They also expect that the use of technology can lead to a higher accuracy, which could enhance integrity and boost public trust in the outcome. In a general sense, the claim is made by these interest groups that the electoral process must "stay up-to-date".

The main use of this Election Agenda is to stimulate the discussion about reforms in the election process. Yet, in these claims, little attention is paid to the vulnerabilities that digital resources also introduce. The context in which elections are organized and the role of digitization in this have changed considerably during the last years. The organization and conduction of elections are receiving increasing public scrutiny - in

the Netherlands in any case. Faith in an orderly course of the elections and in correct results is no longer self-evident, as was the case before 2017. Various possible causes can be considered. To start with, decreased confidence is fed by the worldwide discussion about "external powers" affecting elections. By extension, there is also attention to fake news and concealed influence via such social media as Facebook. More generally, there is greater awareness of cyber-security threats and the associated vulnerabilities of hardware and software used in the chain. This goes for several countries, notably the American presidential elections of 2016, but also for the Netherlands.

In the Netherlands, there is another development that leads to more attention for the way in which the results of elections are established. Increasing political divisions also put the process under pressure. For example, "losers" may benefit politically from questioning the reliability of the elections and the result. Social media offer an easily accessible and extremely effective platform for this. In the process of elections, in which confidence is a large component, it ultimately makes little difference whether the undesirable influence is a true danger or simply a perception.

In the Netherlands, over the course of the years, several measures have been taken to manage the current challenges to the electoral process. One important instrument in this range is the Electoral Support software (Dutch: Ondersteunende Software Verkiezingen - OSV), developed in 2008,[4] after the use of electronic voting devices were forbidden and first used in the European elections of 2009. The Electoral Council is the administrator of this software. In practice, nearly all political parties and municipalities use the software, although this happens on a voluntary basis

The software is first used to support the nomination process. The registration of all participating candidates forms the foundation for all the other steps and official reports that are included in the process. Political parties that want to participate in the elections are offered the possibility to use the software to register their candidates. The software is set up so that, on the basis of the inputted political parties and candidates, various models for the official reports can be created and printed throughout the various stages of the process.

Furthermore, the software is used for the vote tabulation and seat distribution. It is important to point out that this software is not used at the level of the polling stations. As mentioned, the votes cast on paper are first counted manually. It is only once the results are in the town halls that software plays a role. The results from each polling station are manually entered twice into the software which is installed on computers that may not be connected to internet. The software determines the results for the municipalities and prints them on paper. This process is repeated at the district level by the principal electoral committees and eventually by the Electoral Council.

At various moments during the process, results are printed on paper, are brought to the next level in person and manually re-entered into the system. Up until the 2017 election it was also standard procedure that a digital file of the results was transferred together with the paper print by using usb-sticks. This is not done anymore as an extra safety measurement.

Although elections in the Netherlands are still paper-based, this software nowadays plays a key role in the election process. We assume that similar software will be used

in other countries. Yet at the Dutch Electoral Council we hardly have any knowledge of the use and experiences in other countries.

3 The experiences in the elections of 2018

Previously, during the 2017 Dutch parliamentary elections, the process of establishing the outcome unexpectedly took center stage. Shortly before the elections, a national news program brought attention to the presumed unreliability of the software to be used in the elections. Fundamental questions were posed about the reliability of the results and the role of the supporting software used for this. The news item had a significant effect and resulted in parliamentary discussions. This ultimately had consequences for the software's method of use as well. The events, and especially the improvisations that resulted from these in order to establish an official and reliable result within the deadline nonetheless, were described extensively in a paper for the 2017 E-ID conference.[5] As was mentioned in this paper, the situation was complex and unexpected. A month before the elections it wasn't clear which way the results should be determined. At the last minute, some new procedures were required to safeguard the processes and results. The new procedures insisted on a minimum use of digital means.

Dutch elections were held once again in the spring of 2018, this time for the municipal councils. The municipalities themselves were responsible for those elections. A vote was also held at the same time for a corrective advisory referendum. These were elections for which the Electoral Council carried final responsibility. In the run-up to the 2018 municipal council elections and to the referendum, this same news station paid attention to the reliability of the software. For this news item, this news channel had asked a number of "ethical hackers" to evaluate the source code of the software used. In the opinion of this news channel, this resulted in the evidence of some 50 shortcomings.

Nonetheless, after all the commotion in 2017, things had indeed already been changed. To start with, the Electoral Council had already had the software intensively evaluated in 2017 by Fox-IT, a company specialized in auditing and securing software, and by SQS, a company specialized in software quality. This had already resulted in the implementation of improvements at that point.

But certainly not all of the problems had been resolved. After all, the structure of the software and the technologies used dated from 2008. In the course of a decade, insights into the software and into what makes software reliable have changed, along with the context of its use. It would require a major operation to adapt the election software to this. The Electoral Council, the administrator of the software, is aware of this and believes that new software should be developed in the short term on the basis of more stringent regulations. Yet, according to the Electoral Council, the risks were acceptable, provided that everyone involved in the use of the software would stick to the procedures. In the end the results of the elections were determined without any major problems.[6]

4 Integral approach to the risks

Will the development of new software alone be sufficient to make the process sufficiently robust again? Some of the vulnerabilities relate not to the software itself, for example, but to the hardware[7] that the municipalities use to structure the associated processes. This makes it clear that modernizing only the software in order to establish the outcome is not sufficient. Monitoring the electoral process integrally for risk is permanently needed, along with monitoring and mitigating digital threats wherever possible, in order to make the process future-proof and to keep it that way.

In order to make the process future-proof, the existing regulations must also be addressed. The last integral revision of the Dutch Electoral Act dates from 1989. The principles formulated in that regulation no longer fit with the drastically changed and now far more complex context in which elections are held these days. Furthermore, in 1989, no one could foresee the nowadays widespread use of hard- and software. Nearly all current regulations presume a process in which digitization plays no role. In actuality, the changed context makes it virtually impossible to establish results within the deadlines without the use of software. With this in mind, it is curious at the very least that this is not acknowledged in the regulations. So it would be naïve not to include a feasible plan in the regulations to fall back on if this is considered necessary due to external threats.

Finally, it also demands a different view of the speed with which definitive results come about and are publicized. Even if it may be normal in many countries to have a final result be established only after a few weeks, in the Netherlands, the results are irrevocably established within a week after a vote and the new members of Parliament are installed within eight days after the election. So it will be clear that this allows for little or no latitude for serious research into errors in the process, let alone investigating secret undesirable influence for fraud.

5 Whose turn is it?

While unlimited faith in the possibilities and results of digitization may seem to have existed 15 years ago, that picture has been considerably altered in recent years. More attention is now paid to the less positive sides of large-scale digitization such as hacking and other forms of influence. This implies that more attention must be paid to the quality and reliability of digital support and resources. With this, the development of new, reliable digital resources (both hardware and software) has become a complex assignment in which many players must be involved. In addition to government (municipal and federal levels), this also concerns such new players as security services, CIOs, cyber-security experts and (even) ethical hackers.

The procedures surrounding elections must be structured in such a way as to recognize risks prior to an election and to mitigate these wherever possible. In addition, mechanisms must be present to adequately correct errors afterward and to detect fraud. The EMBs responsible for establishing the result have a role in placing the risks on the agenda. These parties cannot be expected to foresee all of the risks themselves, simply

because knowledge about the current threats is missing. Yet they are ultimately responsible for the conduct of the elections. Therefore, they need to work with other institutions to ensure all aspects are sufficiently covered.

As is often the case, government has an important role to play. The decision about whether elections should be viewed as part of a country's vital infrastructure, for example (as is nowadays the case in the United States), requires political consideration. And the balance between the vulnerabilities of paper and of digital processes has a particularly political character. This goes for the consideration of which process (paper or digital) should ultimately be decisive in the event of differences, for example. Finally, residual risks that are difficult to mitigate must be acknowledged by the government and be discussed and - perhaps even more important - also be accepted.

All of this demands a different and broader governance model from the one that we have become used to date. The European Commission for democracy through law (Venice Commission), the International institute for democracy and electoral assistance (International IDEA) as the International foundation for electoral systems (IFES) have all recently addressed the need for a broad, multi-disciplinary collaboration when using technology in the electoral process. This is needed to further strengthen the security of election technologies, and to become more resilient against emerging cyberthreats.[8] In processes with so many players and often turbulent conditions it is even more important to lodge separate responsibilities within the multidisciplinary approach with parties who can (continue to) honor that responsibility in practice. This means that responsibilities, particularly in the digital process, must be assigned and delineated more than is the case at this moment. The various specialist domains and knowledge currently present in government can then be better used. Consider, for example, security services and departments that already concern themselves with cyber-security daily. That knowledge is indispensable. Precisely now, with the structuring and structural maintenance of a robust election process and not simply after a crisis has occurred.

Since the authority concerning elections is allocated among various parties in the Netherlands, it is not immediately evident who is responsible for the development and maintenance of digital resources such as the software used to determine the result. Experience has shown that the responsibility for large ICT projects is a difficult one. The substantive challenges and complications are huge. Although municipalities, the ministry involved and the Electoral Council itself acknowledge and support the need for modernization and better support of the election process, immediate differences in insight then arise about the approach and the responsibilities of the various parties involved.

It can be argued that the guidance and coordination of digital resources in the electoral process should be lodged within a body that oversees the responsibility not only for the entire system, but that can also actually substantiate this. In the Dutch situation, that should be the Minister of Internal Affairs. That person carries political responsibility and has the required multidisciplinary and government-wide resources to actually shoulder that responsibility. At the same time, when bearing such a responsibility, immediate tension arises with the importance of safeguarding the required independence with the actual establishment of an election result. Because of that tension, the Dutch Minister currently elects not to adopt a predominant role.

It is clear however, to everyone in the Netherlands who is involved in the election process, that things will have to change. At present, the discussion revolves around the question who is responsible or should take the lead. But after this will be established (which in itself might still take a year or so), new software has to be developed. And new digital means and procedures will be introduced in the election process, although it is not quite clear which ones these will be. However, the use of electronic voting devices is not expected.

6 From ‘the worst’ to ‘the best’ of both worlds?

There are good reasons to stick with the paper process in the Netherlands. Auditability and transparency are now precisely the significant advantages to the emphasis on paper. The process can then always be reconstructed, and it is much more difficult to affect the results systematically. But that's not to say that it won't represent a lot of work and a huge amount of time.

At the same time, the digital process has also proven its added value in determining the results. Considerably more yield can nonetheless be gained from a modernized version of the software for establishing the result. Software is excellent for use in filing off the sharp edges of logistical challenges and in preventing errors and mistakes. One possibility is an audit of the entry (are implausible values being entered, for example), or providing transparency by making the digital and scanned paper files of the results available. If the results of intermediate steps for arriving at the final results are regularly published on Internet using software, then everyone can also check each step. This makes systematic influence much more difficult.

We assume that other countries are also dealing with the challenge of organizing reliable elections in the present-day context and are also wondering to what extent they can make use of software and computers. That's why we are also interested in hearing whether these challenges are also familiar in other countries. In the long run, we would like to share the various experiences. On that basis, a ‘Code of best practices’ might be established.

After all, organizing and maintaining reliable elections are too important to let individual countries deal with the various challenges all on their own.

References

1. See: Castenmiller P. and Uijl K., The use of supporting software in elections, the peculiar case of the Netherlands 2017. In: R. Krimmer et al (eds.), Proceedings E-Vote 2017, pages 315-325. <https://www.e-vote-id.org/wp-content/uploads/2017/10/TUTPress-2017.pdf>
2. See: Loeber L., E-Voting in the Netherlands; from General Acceptance to General Doubt in Two Years, Electronic Voting, 2008.
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3. See: Castenmiller P. and Uijl K., The use of supporting software in elections, the peculiar case of the Netherlands 2017. In: R. Krimmer et al (eds.), Proceedings E-Vote 2017, pages 315-325. <https://www.e-vote-id.org/wp-content/uploads/2017/10/TUTPress-2017.pdf>
4. The development was initiated by the Dutch Electoral Council, with the support of the Ministry of Interior Affairs. A software company, that has also developed election software for Germany, did the work.
5. See: Castenmiller P. and Uijl K., The use of supporting software in elections, the peculiar case of the Netherlands 2017. In: R. Krimmer et al (eds.), Proceedings E-Vote 2017, pages 315-325. <https://www.e-vote-id.org/wp-content/uploads/2017/10/TUTPress-2017.pdf>
6. Yet, in several municipalities there appeared some 'close calls'. Sometimes, a difference of less than ten votes had an important political impact. This provoked a widespread call for recounts. In more than twenty municipalities, these recounts took place. It is important to stress that none of these recounts took place because there were doubts about the software.
7. The municipalities are expected to use computers that have no direct connection with the internet. Furthermore, they have to use the latest versions of anti-virus software.
8. More information can be found on the following websites:
Venice Commission: [http://www.venice.coe.int/webforms/documents/?pdf=CDL-EL\(2018\)001syn-e#](http://www.venice.coe.int/webforms/documents/?pdf=CDL-EL(2018)001syn-e#)
IDEA: <https://www.idea.int/news-media/news/cybersecurity-and-elections-international-idea-round-table-summary>
IFES: http://www.ifes.org/sites/default/files/ifes_erben_raising_trust_in_electoral_technology_innovation_aided_by_traditional_approaches_d7_apr_2018.pdf