Speed and Efficiency of the Vote Counting Process

Norwegian E-Vote Project

Jordi Barrat i Esteve, Ben Goldsmith and John Turner

June 2012

Global Expertise. Local Solutions.
Sustainable Democracy.

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1. Executive Summary

This assessment report on *Efficient Counting of Votes/Fast Electoral Results* has been conducted as part of a larger assessment of the Norway E-Vote Project, a pilot of Internet voting during the September 2011 local government elections. This report represents one of seven assessment topics conducted on behalf of the Ministry for Local Government and Rural Development (hereafter "the Ministry") in order to analyze the recent pilot, and determine whether a broader adoption of Internet voting would be suitable for future Norwegian elections.

Stated objectives of the Internet voting project included the rapid implementation of elections and the efficient use of resources in municipalities. In conducting this assessment, IFES was requested to assess whether these objectives were achieved during the pilot. In considering how to conduct the assessment into the speed and efficiency of the counting of Internet ballots, IFES considered that two additional analytical indicators needed to be included in the assessment – the quality of the counting and results process and the trust placed in the counting of Internet votes.

Research Approach

The existing system of administering municipal and county elections in Norway is complicated for a number of reasons, and these complexities need to be fully understood when analyzing the possible impact of Internet voting on the counting and results process. Part of this complexity arises from the electoral system itself. Norway uses an open list proportional representation system for local elections, where it is not only possible to express preferences for candidates within your chosen party list, but also from other party lists. Under the existing system, voting is not only possible in polling stations on the day(s) of the election but also during advance and early voting periods, and through postal voting for overseas voters. Ballots have to be counted twice according to the electoral law, and this counting takes place at the polling station, municipality and county locations.

Elections in Norway are organized by Municipal Electoral Committees, with many decisions about the conduct of elections being devolved to these committees. This leads to elections being conducted differently, sometimes significantly so, from one municipality to the next. This is especially the case for the counting process, where ballots can be hand-counted or scanned, and different procedures for counting are often implemented at the polling station, municipal and county level. To add to the complexity, the counting of Internet votes was not the only change being trialed in the pilot municipalities, which could have had an impact on the counting process. Pilot municipalities were also trialing the use of a new election administration system, electronic electoral rolls and a larger ballot paper format.

The combination of these complexities meant that it was a difficult environment in which to isolate the impact of Internet voting on the counting process. This was especially the case because of the small number of pilot municipalities and the fact that Internet voting was a complementary voting channel to existing paper balloting in these municipalities.

As the IFES team considered how to measure the indicators of speed, efficiency, quality and trust for the Internet voting pilot municipalities compared to non-pilot municipalities it became clear that collecting some data for all non-pilot municipalities might be difficult or impossible within the limitations of the project. Therefore, a group of control municipalities was developed. For each pilot municipality two control municipalities were selected from the same county and with similar population levels. One control municipality was selected, which used hand counting of ballots and one which used ballot scanning, creating a control group of 20 municipalities.

A range of measurements was identified for each of the four indicators identified – speed, efficiency, quality and trust. Data to assess these measurements was collected using a variety of research methods, including statistical analysis, in-depth interviews and focus groups.

Research Findings

It had been hoped that the use of Internet voting would lead to a faster counting and results process in the pilot municipalities. Pilot municipalities did see significant reductions in the time taken to count votes and declare the results, a reduction of approximately three hours on average when compared to the time taken in the 2007 local elections. However, control municipalities experienced very similar reductions in the time taken to declare results. While greater reductions were seen for pilot municipalities, the difference was too small to be statistically significant.

Further analysis on a municipality level, rather than an aggregate level, initially seemed to find a relationship between the use of Internet voting (which ranged from 19.8 percent to 31.6 percent in municipal elections) to the time taken to complete the counting and results process. Higher levels of Internet voting seemed to be correlated to faster counting and results. This conclusion was called into question by regression analysis, which indicated that the time taken for the counting and results process in the 2007 local elections was a stronger influence on the time taken in 2011. According to the regression analysis, once this factor was controlled for, no relationship between the level of use of Internet voting and the time taken for the counting and results process could be found.

Of course, there are limits to what can be inferred from the findings of the regression analysis on such a small sample of pilot municipalities. However, the lack of clear evidence of a positive relationship between Internet voting and time taken for the counting and results process should lead to some caution in claiming a relationship through observed correlations.

Given that pilot and control municipalities completed the counting and results process in remarkably similar times, on average, it is highly relevant to assess the resources that they used to achieve this and determine if the use of Internet voting has led to a more efficient counting and results process in pilot municipalities. As every Internet ballot represents a vote, which does not need to be counted at the polling station and municipality/county level, it should also represent a reduction in the resources needed to complete the counting and results process in a similar time. With Internet voting being used for an average of over 25 percent of municipal council ballots cast in the pilot municipalities, it could have been anticipated that approximately 25 percent less resources would have been required to deliver results in the same time in pilot municipalities.

Research into staffing levels for the counting process at the municipal level in fact found that in pilot municipalities there was only one municipality counting staff member for every 1,530 voters, while in control municipalities, approximately three times as many staff were required, with one staff member for every 472 registered voters. While the use of Internet voting may have contributed to fewer resources being required for the counting and results process, it cannot account for this 69 percent reduction in the numbers of staff used to count votes at the municipality level. Other variables not obvious from this analysis must also have a strong influence on the scale of resources used by pilot and control municipalities to count ballots at the municipal level. Given the influence of these other variables, it is not possible to isolate the impact of Internet voting on the efficiency of the counting and results process.

In terms of the national-level resources required to manage Internet voting, only two dedicated staff members were required by the Ministry to manage all aspects of the Internet voting project. Should Internet voting be used on a national level for future Norwegian elections, the Ministry would only anticipate requiring one more staff member and some additional hardware to provide this facility for all voters. Therefore, the expansion of Internet voting is easily scalable from a resource perspective at relatively little additional cost.

The quality of the Internet vote counting and results process was assessed according to a number of measures. As Internet voting should not have allowed the casting of invalid votes, it was expected that pilot municipalities would experience lower levels of invalid ballots overall. The 2011 elections saw 70 invalid paper ballots in the pilot municipalities for the municipal elections, representing 0.07 percent of the number of total votes cast, and 43 in the county elections, representing 0.04 percent of the total votes cast. This compared favorably with the percentage of invalid ballot cast nationally, which was 3,277 (0.13 percent) for municipal elections and 2,312 (0.10 percent) for county elections.

The lower level of invalid ballots in the pilot municipalities is far greater than can be explained by the 26-27 percent usage of Internet voting, indicating that factors outside of this assessment may also be influencing the levels of invalid ballots. Regression analysis was used to analyze the data, and this analysis found that the levels of invalid ballots in the 2007 elections were a far better indicator of 2011 invalid ballot rates. Once this factor was controlled for, no relationship between Internet voting and the levels of invalid ballots could be found. As in the case with the relationship between Internet voting and time taken for the results counting process, the value of regression analysis on such a small data set can lack robustness, but this analysis does indicate that the initial conclusion that the use of Internet voting has led to lower levels of invalid ballots needs to be treated with caution.

The quality of the counting and results process for Internet ballots was assured by the use of end-to-end verification mechanisms, so that each stage of the process could be checked to ensure that votes were received as cast, recorded as received and counted as recorded. The first stage of this was achieved through the use of a return code sent to the voter, which could be checked against a unique set of codes for each party sent only to the voter. Checks were then made of digital signatures, hash functions and zero knowledge proofs to verify that each Internet ballot was included accurately in the various stages of the counting process. The independent organization tasked with conducting this verification

confirmed that all stages of the counting process had been conducted accurately and all legitimate ballots were included as cast in the tabulation of results.

This represents an improvement over the paper balloting process, whether hand-counted or scanned, as mistakes are made in these paper counting processes. These mistakes are natural given the complexity of the electoral system, with preferences possible for candidates both within the selected party list and across party lists, and the manual marking of ballots by voters. Internet voting removes the elements of uncertainty about the marking of paper ballots and mistakes that can arise from the complex system used. It is, however, beyond the scope of this assessment to determine the level of inaccuracies that can be found in the existing counting and results systems and therefore quantify the improvement that Internet voting provides in this regard.

Norway enjoys very high levels of trust in government institutions and in the conduct of elections, so it would be expected that a high level of trust would be given to Internet voting and counting. The fact that so many Norwegians used Internet voting in this first pilot (26.4 percent for the municipal elections) was a strong indication that this mechanism was trusted. This conclusion was supported by data collected in the local democracy survey. Levels of trust expressed in the counting of Internet ballots were lower than hand-counting and scanning of paper ballots, but still very high. Of those questioned, 85% indicated a great deal of trust or some trust in the counting of Internet ballots. Comparatively, 92% of respondents had similar levels of trust in the hand-counting of paper ballots and 94% in the scanning of paper ballots. It could be expected that with the repeated use of the Internet for voting, this level of trust would increase (as long as no problems were encountered). Regardless, these findings do not indicate any serious concerns in the trust placed in the counting of Internet votes.

These findings were further supported by comments received in focus groups with stakeholders and interviews with election administrators in the pilot municipalities. Election administrators especially were very positive about the counting of Internet ballots and had received positive feedback from voters in their municipalities. Stakeholders from the pilot municipalities were generally very positive about the use of Internet voting, trusting it and wanting to see it continued in the future. In contrast, the national stakeholder representatives were unanimously against the future use of Internet voting. It is clear that if Internet voting is to be used again, the Ministry will need to work hard to gain and maintain the trust of these national stakeholders.

Conclusion

Overall, the Internet voting pilots did not demonstrate a definitive improvement in the speed and efficiency of the counting and results process. The failure to see such improvement may be due to peculiarities with the small sample size of pilot municipalities and other factors, which counter the impact of Internet voting in this first use of Internet voting. Some of these factors may not be present if Norway uses Internet voting in the future.

Improvements were identified in the quality of the election using Internet voting, and importantly the use of Internet voting did not seem to undermine the high levels of trust in the conduct of elections and public administration.

Oppsummering av rapport 4

Denne rapporten omhandler et av syv temaer som er vurdert på oppdrag av Kommunal - og Regionaldepartementet i forbindelse med forsøk med elektronisk stemmegivning. Hensikten er blant annet å vurdere om innføring av internettstemmegivning vil være egnet for framtidige norske valg. Denne rapporten fokuserer på e-valgsystemets opptellingsprosess. Det vurderes om internettstemmegivning har forbedret hastigheten, effektiviteten, kvaliteten og tilliten til opptelingsprosessen og om det går raskere å ferdigstille valgresultatet.

Rapporten viser at mens forsøkskommunene som benyttet stemmegivning via internett så en betydelig reduksjon i tiden det tok å gjennomføre opptellingen og ferdigstille valgresultatet, opplevde kontrollkommunene også liknende reduksjon i tid. Mens det i første omgang så ut til å være en sammenheng mellom andelen som benyttet internettstemmegivning og reduksjon i tiden det tok å gjennomføre opptellingen og ferdigstille valgresultatet, viste en regresjonsanalyse at sammenhengen var uklar. Alt i alt støtter ikke de innsamlede dataene fra forsøkskommunene at det er noen sammenheng mellom bruk av internettstemmegivning og tiden det tok å gjennomføre opptellingen og ferdigstille valgresultatet.

Funn viser at det er omtrent tre ganger så mange valgmedarbeidere som teller opp stemmer per velger i kontrollkommunene enn i forsøkskommunene. Mens bruk av internettstemmegivning kan ha bidratt til at det kreves færre ressurser til opptelling og ferdigstilling av valgresultatet, kan dette ikke forklare at forsøkskommunene reduserte ressursbruken med 69 prosent. Andre variabler som ikke er med i denne analysen må derfor også hatt en sterk innflytelse på ressursbruken i forsøks- og kontrollkommunene. På grunn av disse andre variablene er det ikke mulig å isolere internettstemmegivnings effekt på opptelling og ferdigstillelse av resultater.

Det ble brukt flere indikatorer for å analysere kvaliteten på opptelling og ferdigstillelse av resultater. Selv om det var langt færre ugyldige stemmer i forsøkskommunene enn i kontrollkommunene, var reduksjonen mye større enn det som kan forklares ut i fra den andelen som stemte via internett. En regresjonsanalyse indikerte at det ikke er funnet noen sammenhenger mellom antall ugyldige stemmer og andelen internettstemmer. Ende-til-ende-verifiseringen av e-valget gjorde det mulig å verifisere at internettstemmene ble nøyaktig opptalt. Dette er en forbedring fra manuell opptelling som gjøres for hånd eller ved bruk av skannere, hvor feil kan oppstå.

Norge har svært høy tillit til offentlige institusjoner. Den høye andelen som brukte internettstemmegivning i forsøket er en god indikator på at velgerne hadde tillit til denne nye stemmegivningsmetoden. Lokaldemokratiundersøkelsen viste det var lavere tillit til opptelling av internettstemmer og til å ferdigstille resultater elektronisk, enn for å håndtelle og skanne stemmesedler. Samtidig hadde et stort flertall av de spurte, 85 prosent, noe eller stor tillit til opptellingen av internettstemmer.

Samlet sett kan ikke forsøket med internettstemmegivning vise til entydige forbedringer når det gjelder en raskere og mer effektiv opptelling og resultatferdigstilling. Samtidig ble det identifisert kvalitetsforbedringer på grunn av e-valget, og ikke minst viste det seg at internettstemmegivning ikke undergravde den høye tilliten til valggjennomføring og offentlige myndigheter.

2. Introduction

In 2008 the Norwegian Government took a decision, discussed and approved by the Storting (the Norwegian Parliament), to trial the use of Internet voting for Norwegian elections. It was decided that this trial would take place during the local government elections held September 11-12, 2011. Ten of Norway's 429 municipalities were selected by the Ministry to pilot the use of Internet voting during these elections.[1] Internet voting was available in these municipalities during the advance voting period, from August 10 – September 9, 2011.

The primary objectives behind the Internet voting project were to provide better accessibility to voters, to ensure rapid implementation of elections and the efficient use of resources in municipalities, as well as facilitating direct democracy. The Internet voting solution, provided by ErgoGroup and Scytl, was used in pre-trials for youth council elections and local referenda in all of the pilot municipalities from autumn 2010 through spring 2011.

The Ministry, which has responsibility for the oversight of elections throughout Norway, decided to conduct an independent assessment of the Internet voting pilot. The Ministry issued a request for proposals for "Research and Evaluation of the E-vote 2011-Project" covering seven different areas of assessment. One of the areas of assessment related to efficient counting of votes and fast electoral results:

> *"Another key objective of the e-voting trials is to count the votes faster and more efficiently. The customer wants the provider to analyse whether this is achieved. The analys[is] should cover voters, election administrative staff and politicians."*

The International Foundation for Electoral Systems (IFES) was selected to provide the Ministry with this aspect of research and evaluation of the Norwegian e-voting project. To conduct research and evaluation into this topic, IFES assembled a team of experts with considerable experience in electronic and Internet voting:

- **Jordi Barrat I Esteve** is a constitutional law professor in Catalonia and has been involved in a wide range of electronic voting research projects covering many countries using electronic voting technologies, including Internet voting. He has been directly involved in analyzing both Spanish experiences (e.g., Madrid Participa, EU Constitution Referendum, CETIB) and other international examples of electronic voting (e.g., Venezuela, Mexico, Belgium and France).
- **Ben Goldsmith** has been involved in managing international elections and providing advice to election management bodies for nearly 15 years, including supporting the implementation of a number of election technology projects. He helped the Election Commission of Pakistan to conduct a preliminary feasibility study about the use of electronic voting machines, has written a book on conducting electronic voting and counting feasibility studies, and presented to conferences on emerging standards for electronic voting.

[1] The ten municipalities were Ålesund, Bodø, Bremanger, Hammerfest, Mandal, Radøy, Re, Sandnes, Tynset and Vefsn.

- **John Turner** has considerable first-hand experience in conducting multi-channel electronic voting using Internet, SMS text messaging from mobile phones and electronic kiosks in dedicated venues. His experience relates to the design, implementation and evaluation of projects. In addition, he has participated as a member of the Project Board established by the UK Government to select and oversee the evaluation of all types of electronic voting carried out under the pilot programs under legislation introduced in 2000.

Contributions to the analysis presented in this report were provided by Michel Chevallier, Electronic Voting Expert. The team was also supported by Andrea Mandt, a Norwegian Research Assistant, and IFES' Applied Research Center (ARC): ARC Director Rakesh Sharma, Project Manager; Hani Zainulbhai, Research Coordinator; and David Jandura, Research Coordinator.

This report represents the results of IFES' research and evaluation on this topic of the assessment. The report is divided into five main areas:

- **Research Methodology** – Outlines the research approach used in the assessment. This provides details on the kinds of indicators that are used to assess the success of the Internet voting and results process and the measurements used to gauge these indicators. There is also some discussion about the methodological challenges presented in conducting this assessment.
- **Overview of Counting and Results System** – The multiplicity of ways in which voters can vote in Norwegian elections (early voting, advance voting, postal voting and polling station voting) has consequences for the counting process. The introduction of a new voting channel, Internet voting, adds a further complication to this process and the procedures that are required before vote counting takes place. A full understanding of the existing procedures for vote counting is essential for the analysis of how the introduction of Internet voting changes the counting and results process. This section outlines the existing counting and results process and the changes to the process caused by the use of Internet voting. This overview provides a basis for understanding further sections of the assessment.
- **Counting and Results Process Data** – A number of data sources have been identified to help assess the efficiency of the counting and results process. This section presents these sources and illustrates the trends that can be seen from the data. Quantitative data from the 2011 local government election is presented and analyzed, as well as historical data from the 2007 election. The results of three focus groups, two with electoral stakeholders from the pilot municipalities and one with national stakeholders, held after the election is discussed. The results of in-depth interviews with election administrators from each of the pilot municipalities are also presented. Finally, the findings of the various audit mechanisms that the Ministry employed are summarized where they are relevant to the counting and results process.
- **Counting and Results Process Problems** – A number of minor problems were encountered during the counting and results process and the exact nature of these problems is presented.
- **Summary of Key Findings** – The detailed data presented in the later sections of the report is analyzed in terms of the impact that the use of Internet voting has for the counting and results

process. This impact is assessed on four broad measurements: speed, efficiency, quality and trust.

As some of the research involved in this assessment topic required the collection of personal data through the conduct of focus groups and in-depth interviews by IFES, these activities were regulated by the 2000 Personal Data Act. This required that IFES notify the Data Protection Authorities about the research project and the ways in which personal data would be protected. After doing so the Data Protection Agency issued a license authorizing IFES to collect personal data, allowing it to proceed with the research activities required for this assessment.

3. Research Methodology

At an early stage in the project, the expert team considered how the assessment of the efficiency and speed of the counting and results process could be best conducted. The Ministry had specifically requested that the speed and efficiency of the process be assessed, but the team also believed that two other broad indicators needed to be included: quality of and trust in the counting and results process.

Some general points need to be made about the way in which data was collected to measure these four indicators:

- **Types of election**s – The Norwegian 2011 Local Government Elections represented a plurality of elections, not just because there was an election in each locality, but also because there were elections for different levels of local government; elections took place for Municipal Councils as well as for County Councils. Municipalities locally administer the elections for all levels of elected institutions, so that the Municipal Electoral Committee (MEC) is responsible for the conduct of both municipal and county elections in its area of jurisdiction. While the municipality administers the entire election for the Municipal Council, it will only administer part of the election for the County Council, the other municipalities in the county also being involved as well as the county election administration. Therefore, when assessing the impact of the introduction of Internet voting, the municipal election and data related to this election will be the most relevant point of reference.
- **Multiple stages of counting** – Norwegian electoral law requires that all ballots be counted at least twice. Some ballots are counted more than twice – for example, ballots for county council elections are counted at least three times, once at the polling station, once at the municipality and once at the county. The advance votes are also counted separately and reported separately from the votes cast in polling stations on Election Day.2 Preliminary results from the first count of ballots are publically announced and later updated with final results when the counting process has been completed. However, even at this stage the result is not final until it has been approved by the relevant Municipal/County Council. For the purposes of this assessment, the declaration time for results is taken to be the time at which final results for both advance and polling station votes are announced, i.e., when the second and third count has been completed at the municipality and county level, respectively.
- **Different ways of administering counting and results** – The current system of counting and declaring results in Norway is not uniform. Some municipalities count ballots by hand and others count by optical mark recognition scanners. In fact, most municipalities and counties count ballots by a variety of means at different stages of the counting process. Typically, ballots are counted by hand in the polling station with only the votes for the parties counted at this stage (not preferences for candidates within the list or from other lists). National data is not available on how many municipalities and counties then recount the ballots using scanning machines. It would seem that many, if not most, municipalities use scanners for recounting of the ballots and

[2] Although some municipalities had polling over two days (November 11-12) we refer to election day in the singular in this report to indicate the day(s) in which polling took place in polling stations.

the larger the municipality or county in terms of electors, the more likely this is to be the case. These different ways of conducting the counting and results process need to be taken into consideration when assessing the impact of using Internet voting, given that they will impact the time that it takes to conduct the count.

- **Closing time of the polls** – Norwegian electoral law states that counting of Election Day votes shall begin as soon as possible after the polls are closed.3 The MEC decides the hours of polling on the day(s)4 of the election, but polling must end at the latest at 9pm.5 Some municipalities, mainly very small ones, do choose to close polling before 9pm on Election Day, and this obviously affects the time at which they start and complete the counting and results process. This needs to be controlled for when comparing results declaration time data.
- **Comparison with historical data** – An important measurement for the impact of Internet voting on the counting and results process is to compare 2011 data with similar data from previous elections. The most recent elections were the 2009 parliamentary elections. However, given the different electoral system used for parliamentary elections, it was felt that comparison to non-local government elections would not provide useful data. Therefore, historical data comparisons were restricted to previous local government elections. Historical data related to declaration times was used from the 2003 and 2007 local government elections, while other data was only collected for the 2007 local government election as collecting data from earlier elections was not thought to be feasible or meaningful.6
- **Other changes in the administration of elections** – The introduction of Internet voting was not the only change taking place in the administration of elections in Norway for the 2011 local government elections. A pilot that allowed voting for 16-17 year olds was also conducted during the 2011 election in 20 municipalities.7 The introduction of an electronic electoral roll was also trialed and used in all Internet voting pilot municipalities. The electronic electoral roll made it possible to update the municipality electoral roll in real time from polling stations and ensured that voters did not have a paper and an Internet ballot included in the count.8 New ballot formats were introduced in the pilot municipalities. Additionally, a new election administration system was piloted in the Internet voting pilot municipalities. This made for a very dynamic environment in terms of the conduct of elections in Norway at the 2011 elections, making it even more difficult to isolate the impact of Internet voting as opposed to the impact related to other changes in the administration system.
- **Complexity of the Local Government electoral system** – Norway uses a rather complex electoral system for its local government elections. While the basic system, open list

[3] See section 10-5(2) of the Representation of the People Act.

[4] See section 9-2(2) of the Representation of the People Act, the municipal council can also authorize the conduct of polling station voting on the Sunday before the Election Day (which is always a Monday) in one or more locations in the municipality.

[5] See section 9-3(2) of the Representation of the People Act.

[6] The declaration time data is officially logged at each stage of the results process, so this data was available and known to be accurate for the 2003 local government elections.

[7] Four of the Internet voting pilot municipalities also piloted voting for 16-17 year olds – Ålesund, Hammerfest, Mandal and Re – as well as four of the control municipalities – Austevoll, Kautokeino, Luster and Tysfjord.

[8] The electronic electoral roll also made is possible for voters to cast a vote in other electoral areas within their municipality. Since the electronic electoral roll could be updated in real time, the ballot papers didn't need to be treated like normal alien votes but could go right into a dedicated ballot box for such votes.

proportional representation, is a common system in many countries, Norway implements it with a number of features that make it considerably more complex, especially when it comes to the counting and results process. Not only are Norwegian voters able to express preferences for candidates within their party list of choice, but they can also vote for candidates from other party lists. Where voters select candidates from other lists, this has the effect of reducing the value of the vote that is given to their party of choice, and giving a part of their vote to the party, or parties, of the candidate(s) that they select from other lists. This is in addition to the possibility that they have of altering the order in which candidates are elected from these other lists. Given the complexity of the counting and results process under this electoral system, it is clear that there could be significant advantages to the computerization of the voting and counting process with Internet voting. It is also important to note that the advantages of using Internet voting may not be as apparent in different electoral systems, which might be used for other levels of elections in Norway.

- **Internet voting as an alternative** – A further challenge in identifying the impact of Internet voting in the pilot municipalities is related to the fact that, in the pilot municipalities, Internet voting is only used as a supplemental channel for voting. It was not clear before the election what level of interest Internet voting would generate. Therefore, both systems of voting, paper and Internet, needed to have sufficient resources allocated to them to be able to deal with possible high levels of comparative demands. The fact that Internet voting was conducted alongside paper voting also makes it difficult when examining electoral statistics to determine the specific impact of Internet voting.

All of the above factors need to be taken into consideration when analyzing the impact of Internet voting on the counting and results process.

In considering the speed, efficiency, quality and trust in the counting and results process using Internet voting, a thorough analysis of the impact needs to be made comparing these indicators for Internet voting municipalities against the same indicators for non-pilot municipalities. This could be done by comparing data from the pilot municipalities to data from all of the non-pilot municipalities. However, as the team explored the measurements that would be used to assess these four indicators, it became clear that some of the required measurements might be difficult or impossible to collect for all municipalities within the limitations of the project. It was also apparent that some of the indicators might be determined to a significant extent by municipality-specific factors. For example, the number of voters and polling stations would determine how quickly the municipality could complete the counting and results process, as might the use of counting machines to scan the ballots. There was no way of knowing if the pilot municipalities, as a group, were entirely representative of national trends in this regard and could therefore be accurately compared to data collected for the whole country.

Therefore, it was decided that a group of control municipalities would be developed and used for comparative purposes for the indicator measurements. The way in which this control group was developed is explained below, followed by an explanation of the different measurements used to assess speed, efficiency, quality and trust in the counting and results process for the Internet voting pilots.

Control Municipalities

The selection of appropriate control municipalities for the assessment of the counting and results process could have been conducted on a range of social, cultural and political indicators for the pilot municipalities to try and find the best match on these indicators. However, it was felt that there were three main features of the pilot municipalities that would best be used to indicate comparable control municipalities. These were:

- **The pilot municipality county** – will help to define socio-economic indicators, which should be similar in control municipalities from the same county
- **Size of the municipality** – in combination with the county, will help to define socio-economic indicators, which should be similar in control municipalities but will also be important in determining the logistical challenges of counting votes
- **Method of counting ballots** – whether by hand, by ballot-scanning machine or a combination

While additional pilot municipality features could have been used to try and identify municipalities, which were even more closely matched to the pilot municipalities, either the indicators were seen as too difficult to develop[9] or were seen to have relatively little impact on issues being assessed in this report compared to those identified above. Increasing the number of selection criterion for control municipalities and, with only selecting from a finite number of municipalities, it was also possible that more complex selection criterion would fail to identify suitably similar municipalities.

Therefore, the selection of control municipalities was conducted according to only the three criteria listed. It was decided to include two municipalities for each pilot municipality: one control municipality using hand counting and one control municipality using ballot scanning. This created a control group of 20 municipalities.

The development of a control group of municipalities according to these criteria was possible in all but two cases: the pilot municipalities of Ålesund (Møre og Romsdal County) and Sandnes (Rogaland County). Ålesund is the largest city in the county and therefore it was not possible to find another municipality of roughly equal size in the same county. Sandnes is also a large city in the county, with only Stavanger being of comparable size (Stavanger being the largest city in the county). Initially Stavanger had been identified as a control municipality for Sandnes, but on further investigation it was determined that Stavanger conducted its counting process in a way that was not comparable to Sandnes. In these cases, the largest other municipalities in the county were selected.

The full list of control municipalities is included in Annex 1 of this report.

[9] For example, one of the challenges that municipalities face, which may impact the speed of the counting process, is the remoteness of the polling stations from the municipal center. This will obviously impact the time it takes to transport ballots to the municipality for the second count. However, the development of an indicator to demonstrate the distance and ease of access between polling stations and the municipality would have been very difficult.

Speed of the Counting and Results Process

The speed of the counting process relates to the time it takes to count the votes and to declare preliminary and final results for elections. Declaration times, for the various stages of completion of the count and results process are provided by the Ministry, through Statistics Norway. The following measurements were used to assess this indicator:

- Declaration times of the pilot municipalities for the 2011 election
- Polling hours for pilot municipalities for the 2011 election
- Declaration times of the pilot municipalities for the 2007 election
- Polling hours for pilot municipalities for the 2007 election
- Declaration times of the pilot municipalities for the 2003 election
- Polling hours for pilot municipalities for the 2003 election[10]
- Declaration times for the control municipalities for the 2011 election
- Polling hours for the control municipalities for the 2011 election
- Declaration times for the control municipalities for the 2007 election
- Polling hours for the control municipalities for the 2007 election
- Declaration times for the control municipalities for the 2003 election
- Polling hours for the control municipalities for the 2003 election

It should be noted that the declaration times will be used in conjunction with the time of the close of the polls in each municipality to determine the length of time that it took to complete the counting and results process.

The data that this provides is used to analyze the impact of Internet votes on the declaration times of the pilot municipalities as a group compared to the control municipalities. Further analysis is then conducted to see if the impact of Internet voting on declaration times is also determined by the number of voters in the municipality and the usage of Internet voting.

Efficiency of the Counting and Results Process

Efficiency can be seen as the time and resources required to complete a given task – the counting and results process in this instance. A full assessment of the efficiency of the counting and results process would require a cost benefit analysis, including detailed financial and resource analysis of counting under the current system compared to the counting of Internet votes. It was felt that such a detailed financial and resource analysis was not the intended purpose of this assessment topic, and, therefore, was not proposed by IFES. It was also clear that Norway is not experimenting with Internet voting as a replacement for existing ways of voting, but as a possible supplemental channel of voting to be used nationally with voters having the choice of whether to use it or not. A comparative cost of the counting of Internet votes against the cost of counting using existing systems is not a comparison, which has much value for the debate about the possible future use of Internet voting.

[10] It is assumed that the close of the polls in 2003 was the same as in 2007 for the pilot and control municipalities.

It is also worth noting that as Internet voting is only likely to be used as a supplemental voting channel in Norway, it is impossible to assess the likely interest in using this channel in the future. The significant take-up of Internet voting in the pilots, over 25 percent, would seem to indicate that it could be a popular means of voting. However, it is not possible to base predictions on such a small sample and the future use of Internet voting would also be highly dependent on voter trust in Internet voting, a factor that can be very volatile. The exact balance between Internet and paper voting would determine the consequences for the comparative costs between the two methods of counting. Due to the uncertainty at each election about how many voters would use Internet voting, the full efficiency benefits of Internet voting will never be truly realized while it is only a supplemental channel of voting.

IFES has used qualitative indicators to gauge the impact of using Internet voting on the efficiency of the counting and results process. These indicators include:

- The resources allocated by pilot municipalities to the counting of ballots at the municipal level, and the time taken to complete the counting process
- The resources allocated by control municipalities to the counting of ballots at the municipal level, and the time taken to complete the counting process
- Any specific skill sets required for staff administering the counting process at the municipal level, and any difficulty in finding qualified staff with these skill sets
- The resources required by the Ministry to administer the counting and results process for Internet votes for the 2011 election
- The anticipated resources required by the Ministry to administer the counting and results process if Internet voting was used nationwide
- Any challenges anticipated by the Ministry in securing the skill sets required to conduct Internet voting for this election or for a possible extension of Internet voting in the future
- The efficiency of collecting lists of voters attending polling stations from the municipalities
- The efficiency of releasing final results of counting of Internet votes from the Ministry to the municipalities

Quality of the Counting and Results Process

While not identified as an indicator by the Ministry in the assessment of this topic, the team felt that the inclusion of measurements to assess the quality of the counting and results process was essential for making a full assessment of the impact using Internet voting. Implementing a faster and more efficient system in terms of resources would mean little if it detracted from the quality of the counting process, seen as the extent to which the results published were an accurate reflection of the votes cast by electors.

As such, the quality of the counting and results process can be seen as an essential component of the overall integrity of the election process, and electoral integrity is an integral part of free and fair elections.[11]

[11] See the ACE Project - http://aceproject.org/main/english/ei/ei10.htm [last accessed on March 5, 2012].

A number of quantitative and qualitative measures were identified to help assess this indicator:

- The number of invalid Internet votes cast in the 2011 pilot elections
- The number of invalid paper ballots cast nationwide for the 2011 elections
- The number and nature of complaints received in each pilot municipality, which relate to the counting and results process
- The number of complaints received in each pilot municipality, which are upheld relating to the counting and results process
- The number and nature of complaints received in each control municipality, which relate to the counting and results process
- The number of complaints received in each control municipality, which are upheld relating to the counting and results process
- The results of the audit mechanisms used to check the functioning of the systems used for the various stages of counting the Internet votes and producing the results from the Internet votes
- Review of mechanisms to ensure that multiple voting does not take place where Internet voting is used

Trust in the Counting and Results Process

Election administrators face two challenges in conducting elections: to administer elections that accurately reflect the will of the voters and to administer elections, which stakeholders believe accurately reflect the will of the voters. Discussing online systems, like Internet voting systems, Corritore *et al* define trust as, "an attitude of confident expectation in an online situation of risk that one's vulnerabilities will not be exploited."[12]

The need for election management bodies to build the trust of all involved in the electoral process is clearly identified as one of the key challenges for election administrators in the European Commission's Methodological Guide on Electoral Assistance.[13] Unfortunately for election administrators, succeeding in the first of these challenges will not guarantee succeeding in the second. To fail in the latter has the potential for serious consequences in the legitimacy of the elections and the elected institutions. If a sufficient number of citizens do not believe that the results reflect the will of the voters, their trust in elected institutions and the government of the country may be seriously undermined.

The overall success of administering a successful counting and results process for the Internet pilots requires that the counting and results process is not only done correctly but that the process is trusted to deliver accurate results by the voters and other electoral stakeholders.

This report will not assess the mechanisms that have been implemented by the Ministry and local election administrations to build and maintain trust. These issues are dealt with in other parts of the assessment. However, this report assesses the extent to which electoral stakeholders have placed trust in the Internet vote counting and results process. It will compare the level of trust in the Internet vote

[12] Corritore, C. L., Kracher, B. and Wiedenbeck, S. (2003) "On-line Trust: Concepts, Evolving Themes, a Model", in International Journal of Human-Computer Studies, vol. 58, p. 740.
[13] European Commission (2006) Methodological Guide to Electoral Assistance, p. 80.

counting and results process with hand counting and ballot scanning processes. The comparative level of trust in the Internet vote counting and results process is assessed through the following measurements:

- **Local Democracy Survey Question** – ISF agreed to include a question in its Local Democracy Survey about the trust that voters have in the different methods of counting ballots
- **In-Depth Interviews with Election Administrators** – interviews took place with election administrators from each of the pilot municipalities and these interviews were used to explore in detail the administrator's attitudes to the counting and results process for Internet votes and for paper ballots using hand counting and scanning
- **Focus Groups with Election Stakeholders** – focus groups involving a range of electoral stakeholders took place, and these focus groups were used to explore the stakeholders' attitudes to the counting and results process for Internet votes and for paper ballots using hand counting and scanning
- **Internet Voting Usage** – an important indicator of how much the Internet voting system was trusted by voters can be seen by the extent to which voters entrusted Internet voting with their vote during the electoral process
- **Number and Content of Complaints** – the number and content of complaints received about the count and results process will not only be an indication of the quality of the process, but also the level of trust in the system (a system, which is not trusted can lead to a large number of complaints about it, even if the complaints are without substance – a clear indication that some do not trust the system)
- **Comparison of transparency mechanisms** – the transparency mechanisms that exist for the Internet voting counting and results process will be compared to those that exist for the hand counting/ballot scanning processes

Research Tools

Both qualitative and quantitative measurements were used to analyze data for this report. The combination of multiple research methods allowed for an evaluation of the pilot's overall impact while providing important details of the administration. The following tools were used to evaluate the Internet voting system:

- Statistical analysis
- In-depth interviews
- Focus groups

Statistical analysis included both time-series analysis as well as cross-regional comparisons of the different municipalities. The choice of statistical test was based on data available and appropriate use. Ordinary Least Squares (OLS) regression allowed for testing casual inference between independent and dependent variables. While the small number of variables places some constraints on what OLS regression can tell us, its inclusion helped test important relationships related to the impact of Internet voting.

Most statistical analysis was conducted through difference of means testing, which helped IFES observe the effect of Internet voting when OLS regression was inconclusive. While lacking some of the definitive conclusion that OLS can provide, difference of means allowed IFES to view significant differences between treatment and control variables. Difference of means tests compared 2011 pilot municipality data with national averages, as well as information collected from control, non-pilot areas. Control municipalities were selected after careful evaluation that considered an area's size, location, demographics, and method of counting ballots.

In-depth interviews were conducted with persons involved in election administration. The interviews were semi-structured, with each municipality representative being asked the same questions. This helped IFES probe specific issues related to the administration of an Internet voting system.

IFES utilized three separate focus groups to study participants. The group dynamic allows for the sharing and development of ideas that might not otherwise come out in individual interviews. Focus groups were held with political party representatives from the pilot municipalities as well as national electoral stakeholders. The selection of focus group participants helped IFES gauge perceptions of both national-level stakeholders and those who were more directly involved with the pilots at the local level.

4. Overview of Counting and Results System

This section of the report will start by providing an overview of the existing counting and results process used for local government elections. The counting of polling station votes and advance votes will be explained, as will the various stages of counting at the polling station, municipal and county level. Next the process of Internet voting will be explained, consisting of the special procedures applied for the processing and counting of Internet votes and the process for inclusion of these Internet votes in the overall results.

Existing System

For inland voting (on the mainland of Norway) there are three periods in which voters can cast a ballot:

- **On Election Day in polling stations** – Each polling station has a list of voters eligible to cast a vote in that polling station and votes are cast accordingly, with the names of voters being marked as having voted on the list of electors for that polling station. It is also possible on Election Day for voters to vote in a polling station for which they are not registered, although such votes will normally only be approved if they are cast polling stations in the municipality where the voter is registered to vote.[14]

  "Alien" votes15 cast like this are placed inside an envelope, which is then placed inside another envelope with the name, address and date of birth written on the outside of this envelope. The MEC is responsible for conducting the approval process for these ballots. This is done by checking whether voters are already marked off in the electoral register in the polling station where they are registered.[16]

- **Advance Voting** – Ordinary advance voting begins on August 10 of the election year and ends on the last Friday before Election Day.17 Advance voting locations are generally established at a number of sites in each municipality, including institutions such as health and social welfare institutions, prisons and military camps. Ballots cast during the advance period are placed inside a ballot paper envelope and are placed with the voter's polling card inside a cover envelope.

  Voters using the advance voting period do not need to vote at a location in their own municipality. Ballots cast in the advance period are sent to the appropriate MEC, where the approval process for advance ballots is conducted when the electoral register is ready. The MEC checks that the voter is eligible to vote and that they have not already voted. If these conditions are both true and the ballot paper is valid, then the ballot is approved for inclusion in the preliminary count of advance votes.

[14] There are a few exceptions to this, for example voters registered at a secret address.
[15] The term used in Ministry of Local Government and Regional Development (2009) – Election Manual: Overview of Election Rules, p. 76.
[16] Ibid, p.77.
[17] Section 8-1(1) of the Representation of the People Act.

As many advance votes as possible are processed in this manner before the electoral registers are printed for distribution to polling stations. Voters who have voted during the advance period and been processed by the MEC before the printing of the electoral register are pre-marked on the register as having voted.

Some advance votes are received after the printing of the electoral registers. In these cases, it is only possible to submit these to the approval process after the registers are returned from polling stations. Once these registers are returned, any unapproved advance votes are checked to see if the voter also cast a vote in their polling station on Election Day. If so, the advance vote is rejected. Otherwise the advance vote is approved and the voter is marked as having voted on the electoral register. Any advance votes received after the close of polling are rejected.

- **Early Voting** – As of the 2009 Parliamentary Election, inland voters in Norway can also vote in an early voting period from July 1 till August 9 of the election year. Fewer locations are provided for voting during this early voting period. Electoral registers are not finalized by the time early voting starts, and therefore the approval of these votes is delayed until the electoral registers are ready. In all other respects, the administration and processing of these early votes are the same as described above for advance voting.

Due to the different periods in which votes can be cast in Norway, the regulations for counting establish two distinct stages in the ballot counting process – the approval of ballots and the counting of ballots. The process for the approval of advance and early votes is discussed above. The process for approval of polling station votes takes place in the polling station by the Polling Committee (PC), and any ballots placed in the ballot box and not in a ballot envelope are considered as approved and ready for counting.

The law requires that the number of votes cast for each electoral list is counted twice during the counting process and these counts are referred to as the preliminary count and the final count.[18] The counting of ballots at local government elections is typically conducted at two or three different levels, depending on the election:

- **Polling Station** – The MEC decides whether the preliminary count of polling station votes is conducted in the polling station, and in most cases it is. The polling station staff will count approved ballots, with ballots placed in ballot envelopes being set aside for the MEC to approve and count if required. The count will take place immediately after the close of polls. Typically, the polling station will only count the number of votes cast for each electoral list, and not the preferences within lists and votes cast for candidates from other lists. In some cases, the polling station will only count the number of ballots cast, and not the number of votes for each party list.

[18] Section 10-4(5) of the Representation of the People Act.

- **Municipal Electoral Committee** – All of the ballots cast in polling stations are sent in to the municipality and are recounted by the MEC.19 For the municipal election this count includes the preferences for candidates within the electoral lists and from other electoral lists, while for the county election it excludes the candidate preferences. The MEC is also responsible for approving and counting advance votes received for the municipality. The counting of advance votes received and approved before the printing of electoral registers starts no later than four hours before the end of polling in the municipality,20 and the results from this count are included in the preliminary results announced by the MEC for the Municipal Council election (county election ballots are also counted in the municipality but the results of this count are passed to the County Electoral Committee).

  All advance votes are counted again after the remaining advance votes have been approved by the MEC (only possible once the electoral registers are returned from polling stations). This second count of the advance votes is added to the municipality count of the polling station votes to produce a final result for the municipal election.

- **County Electoral Committee** – All ballots related to the county elections are forwarded to the County Electoral Committee (CEC), which counts all ballots for a third time including the preferences for candidates within the electoral lists and from other electoral lists. The CEC declares the preliminary and final result for the county election.

Although these declared results are considered as final, the law still requires that final approval of the election results are provided by the newly elected Municipal Councils for municipal elections, or the newly elected County Councils for county elections.

Another important aspect of the existing system of counting for Norwegian elections is that both hand-counting and ballot scanning machines are used to count votes, and that the method of counting is determined by the local election administration. This means that there is no uniformity to the balance between hand counting and scanning of ballots. Typically, counting is conducted by hand in the polling stations, but not in every case. In the majority of cases, counting at the municipal and county level is done by ballot scanners. However, in small municipalities with few voters, hand counting may still be used because there are insufficient ballots to justify the cost of using scanning machines.

Internet Ballot Count Process

The use of Internet voting does not change the processes described above for the counting of advance paper votes and polling station votes. It creates several additional stages to the counting process. Because of the primacy attached to the paper ballot, which will always override the Internet ballot, the counting of the Internet ballots occurs at the end of the counting process. Three distinct phases of the counting of Internet votes are conducted:

[19] Or counted twice in the case that the polling station did not conduct a full preliminary count.
[20] Section 10-5(1) of the Representation of the People Act.

- **Cleansing** – Since multiple Internet votes can be cast, and also because any paper ballots cast take precedence over any Internet votes cast, the Internet votes have to be "cleansed." This cleansing consists of removing any duplicate Internet votes from the same voter, with only the last Internet vote cast being counted. It also involves comparing the list of voters who have cast an Internet vote with the voters who have cast a paper ballot. All those Internet votes where a paper vote has also been cast by the voter are removed from the Internet ballots to be counted. Ballots cast by voters who have been removed from the electoral roll subsequent to voting are also removed during the cleansing process.

  Furthermore, the cleansing stage of the vote counting process entails the removal of the personal data associated with Internet votes, so that the identity of the voter can no longer be determined. The remaining ballots to be counted proceed to the mixing process.

- **Mixing** – The mixing process serves to make the Internet vote completely anonymous. First, all of the votes entering the mixing phase are re-encrypted making it impossible to link them with the previously stored votes. The order in which ballots are stored in the voter server could still, in principle, identify voters as these votes are stored in the order in which they are cast.21 Therefore, a second step is required, in which the now anonymous ballots are re-ordered (mixed) so that there is no way of linking a vote value to a voter. The resulting dataset of votes is completely anonymous, containing different cryptotext in a random order.

- **Tallying the votes** – At the start of the tallying process the votes are still encrypted, and the next step involves the decryption of the votes using the decryption key parts distributed to the ten decryption key-holders. Once the votes have been decrypted, the vote totals for each political party on the ballot can be calculated, as well as the preferences expressed within the lists and from other lists.

The general framework for the counting of paper votes is also applicable to the counting of Internet votes, requiring that Internet votes be counted twice. The preliminary count of Internet votes was conducted by the Ministry at the close of polls across Norway, e.g. beginning at 9pm on September 12, 2011. It was not possible to conduct a complete cleansing of votes at this point as data about voters who had cast a ballot in a polling station had not yet been returned from the polling stations. The cleansing of Internet votes for the preliminary count therefore only cleansed this data against electoral registers provided by the pilot municipalities at 6pm on the evening of polling. Not all advance votes had been processed by municipalities at this point, and the polling stations were still open so it was possible that additional paper ballots might be cast, which cancelled out Internet ballots.

The final count of Internet votes for each municipality was only possible when the municipality polling was closed and all of the advance votes were processed. Therefore, individual municipalities were ready to conduct a final count of their Internet votes at different times on election night. The Ministry

[21] The cleansing process also may have re-ordered some of the votes.

conducted the final count of municipalities' Internet votes as they were ready to do so, sometimes grouping municipalities, which were ready at similar times in the evening.[22]

[22] It should also be noted that the use of electronic electoral rolls in the pilot municipalities resulted in different handling of alien votes (votes cast in the correct municipality, but in a different polling centre). Rather than inserting these ballots into double envelopes for later approval, they were marked off in the electronic electoral roll and put into an "alien ballot box." The electronic electoral roll allowed for instant 'approval' of the alien ballots if the voter had not already cast a ballot, meaning that the alien ballots could be merged and counted as soon as they were received in the municipality.

5. Counting and Results Process Data

This section of the report will present the data collected as part of the assessment of the counting and results process for Internet ballots. First, base data on the usage of Internet voting is presented, along with the results of the different stages of the counting process for Internet votes. Next, quantitative data related to the time taken to declare results, the number of invalid ballots, complaints, and the local democracy survey question on the counting of ballots are presented and analyzed. The key findings from the stakeholder focus groups and in-depth interviews with election administration staff are then discussed. Finally, data on the resources required to conduct the counting process and the results of the audit process are presented.

The data is presented according to the research methods that were used to collect it. Later in the report the data is analyzed according to the four criteria (speed, efficiency, quality and trust) used to assess the counting and results process for Internet votes.

Base Electoral Data

Some base electoral data will be important to analyze data presented later in this section. Figures 1 and 2, respectively, show turnout and Internet usage data for the municipal and county elections in each of the pilot municipalities.

While it is not the purpose of this report to assess and analyze turnout and Internet voting usage data - other parts of the assessment will do that - this data provides a frame of reference for other aspects of the analysis of the counting and results process, and will be referred to in the coming sections.

Figure 1 – Municipal Election Turnout and Internet Usage

Municipality	2007[23]			2011				
	Eligible Voters	Turnout	Turnout (%)	Eligible Voters[24]	Turnout[25]	Turnout (%)	Internet Votes[26]	Internet Votes (as % total)
Ålesund	31,655	18,284	57.76%	34,535	20,580	59.59%	5,434	26.40%
Bodø	34,731	20,377	58.67%	36,635	23,936	65.34%	6,957	29.07%
Bremanger	3,006	1,959	65.17%	2,955	1,938	65.58%	407	21.00%
Hammerfest	7,108	3,679	51.76%	7,752	4,349	56.10%	1,126	25.89%
Mandal	10,837	6,643	61.30%	11,764	7,354	62.51%	1,457	19.81%
Radøy	3,518	2,451	69.67%	3,687	2,459	66.69%	768	31.23%
Re	6,270	3,940	62.84%	6,870	4,384	63.81%	981	22.38%
Sandnes	44,786	27,443	61.28%	48,689	30,358	62.35%	8,193	26.99%
Tynset	4,118	2,676	64.98%	4,163	2,855	68.58%	903	31.63%
Vefsn	10,379	5,901	56.86%	10,456	6,161	58.92%	1,328	21.55%
TOTAL	**156,408**	**93,353**	**59.69%**	**167,506**	**104,374**	**62.31%**	**27,554**	**26.40%**
All Municipal Elections					2,440,428	64.2%		

[23] Source - http://www.regjeringen.no/krd/html/valg2007/bks.html [last accessed on February 7, 2012].
[24] Source - http://www.ssb.no/english/subjects/00/01/20/kommvalg_en/tab-2011-11-04-04-en.html [last accessed on February 7, 2012].
[25] Turnout is calculated on the basis of all approved, blank and invalid ballots cast. Source – email from the Ministry on November 28, 2011, in Annex 2.
[26] This is the number of counted Internet votes for the respective municipal elections i.e. with the cleansed votes removed. Source – email from the Ministry on November 28, 2011, in Annex 2.

Figure 2 – County Election Turnout and Internet Usage

Municipality	2007[27]			2011				
	Eligible Voters	Turnout	Turnout (%)	Eligible Voters[28]	Turnout[29]	Turnout (%)	Internet Votes[30]	Internet Votes (as % total)
Ålesund	31,655	17,198	54.33%	33,457	18,719	55.95%	5,029	26.87%
Bodø	34,731	19,503	56.15%	36,635	22,534	61.51%	6,695	29.71%
Bremanger	3,006	1,796	59.75%	2,955	1,744	59.02%	376	21.56%
Hammerfest	7,108	3,331	46.86%	7,502	3,727	49.68%	993	26.64%
Mandal	10,837	5,980	55.18%	11,355	6,408	56.43%	1,318	20.57%
Radøy	3,518	2,270	64.53%	3,687	2,162	58.64%	710	32.84%
Re	6,270	3,652	58.25%	6,616	3,954	59.76%	897	22.69%
Sandnes	44,786	26,445	59.05%	48,689	29,127	59.82%	7,935	27.24%
Tynset	4,118	2,421	58.79%	4,163	2,334	56.07%	756	32.39%
Vefsn	10,379	5,473	52.73%	10,456	5,419	51.83%	1,218	22.48%
TOTAL	**156,408**	**88,069**	**56.31%**	**165,515**	**96,128**	**58.08%**	**25,927**	**26.97%**
All County Elections				3,789,746	2,271,152	59.93%		

Cleansing, Mixing and Counting Process

The cleansing, mixing and counting of Internet votes began in the Ministry's office in Oslo on the evening of September 12, 2011, beginning with a preliminary count of Internet votes a couple of hours before the close of polls at 9 p.m. While the cleansing and mixing processes were completed for this preliminary count before 9 p.m., the actual decryption and counting of the cleansed and mixed votes did not take place until polls had actually closed at 9 p.m. The preliminary count of Internet votes was completed around 9:15 p.m. on the evening of polling.

It must be remembered that the final count of Internet votes, which required the cleansing, mixing and counting processes to be conducted again, was not possible until the electoral registers had been sent in by the municipalities with all advance and Election Day voters marked on the register. As a result, this final count was conducted on a municipality-by-municipality basis as this data was received by the Ministry. However, in some cases several municipalities were processed at the same time if their electoral register data was available at that time.

The results of the final cleansing component are displayed on Figure 3 and Figure 4.[31]

[27] Source - http://www.regjeringen.no/krd/html/valg2007/bfs.html [last accessed on February 7, 2012].

[28] The number of eligible voters differs between the municipal and county elections because of the pilot municipalities, which also participated in the trial of voting rights for 16-17 year olds. These 16-17 year old voters were only able to cast a vote in the municipal election, hence there are more eligible voters for municipal elections than county elections in these municipalities. Source - http://www.regjeringen.no/krd/html/valg2007/bks.html [last accessed on February 7, 2012].

[29] Source - http://www.ssb.no/kommvalg_en/tab-2011-11-04-06-en.html [last accessed on February 7, 2012].

[30] This is the number of counted Internet votes for the respective county elections i.e. with the cleansed votes removed.

Figure 3 - Number of Municipal and County Votes Cleansed, by Municipality

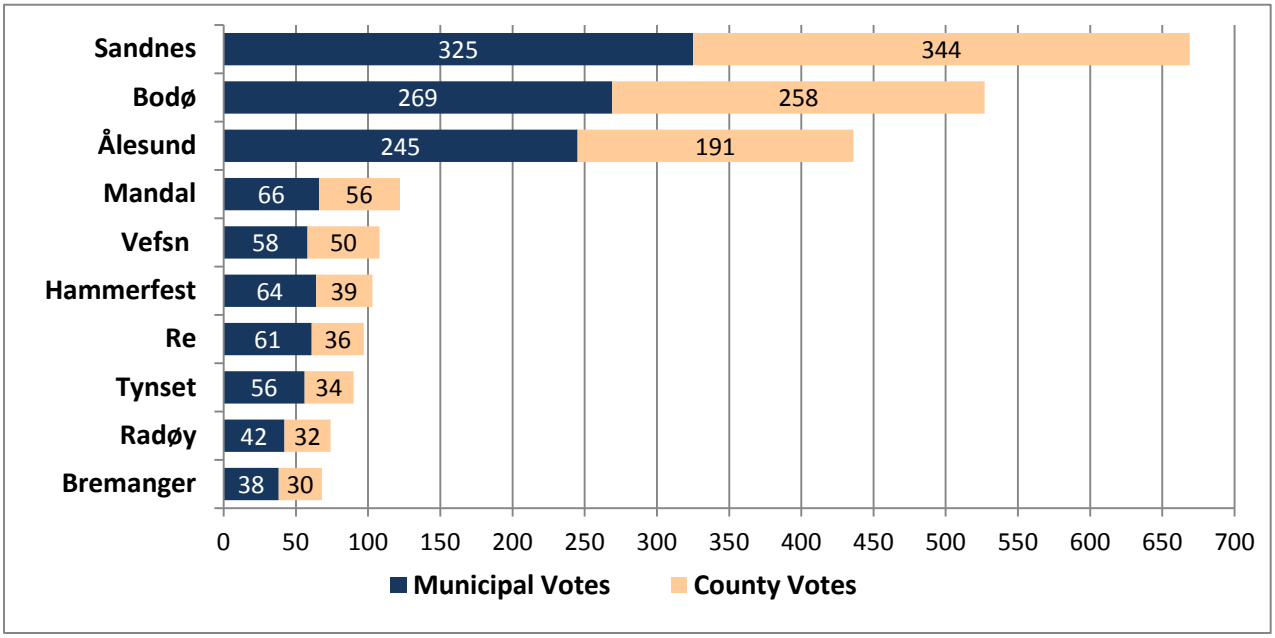
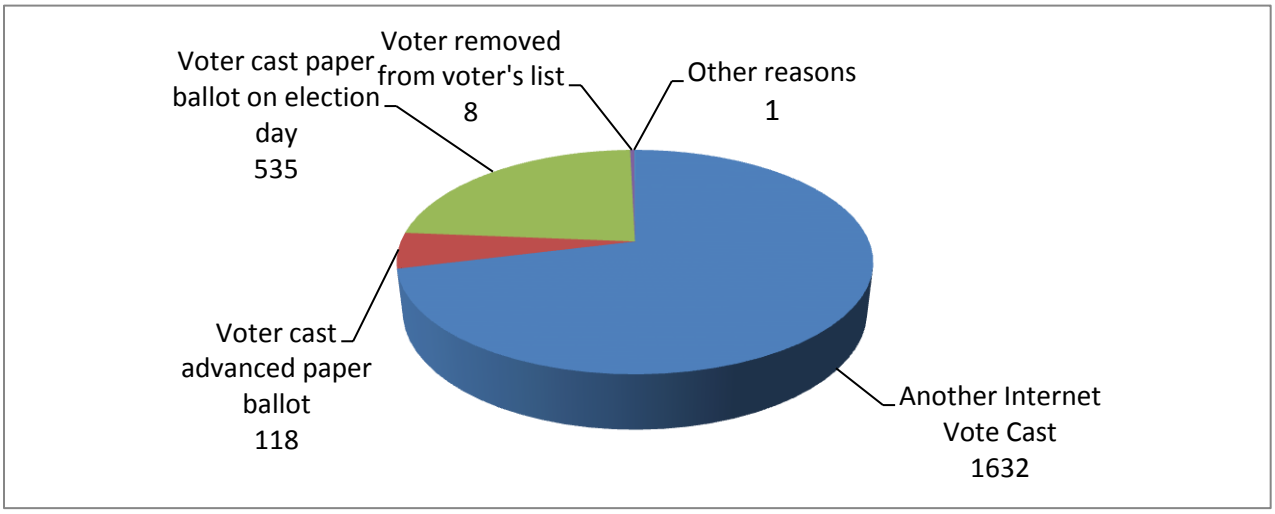


Figure 4 - Reasons for Cleansing of Internet Votes



A total of 2,294 Internet votes were cleansed, and therefore, not included in the final count. This consists of 1,224 municipal Internet votes and 1,070 county Internet votes, meaning that a total of 55,775 Internet votes were cast in tota,[32] and that just over 4 percent of the cast Internet ballots were cleansed and not counted. The vast majority of these cleansed votes, 71.14 percent or 1,632 votes, were

[31] Data provided by the Ministry by email on October 20, 2011, and included in Annex 2.
[32] Number of county ballots counted plus the number of municipal ballots counted plus the number of cleansed votes.

due to the voter casting another Internet vote.[33] In all, 1,070 voters cast a repeat vote, with the highest number of repeat votes cast by one voter being five.

Of the remaining cleansed votes, 653 were due to the fact that the Internet voter cast a paper ballot, 118 of these cast in the advance period of voting and 535 on Election Day. Eight Internet votes were cleansed because of the removal of the voter from the electoral roll and one for other reasons.[34]

The number of cleansed votes for each municipality election was compared to the number of Internet votes cast in Figure 5 below.

Figure 5 – Cleansed Votes in Municipal Elections as a Percentage of Internet Votes[35]

Municipality	Eligible Voters	Turnout	Turnout (%)	Internet Votes	Internet Votes (as % of total)	Cleansed Votes	Cleansed as % of Internet Votes
Ålesund	34,535	20,580	59.59%	5,434	26.40%	245	4.31%
Bodø	36,635	23,936	65.34%	6,957	29.07%	269	3.72%
Bremanger	2,955	1,938	65.58%	407	21.00%	38	8.54%
Hammerfest	7,752	4,349	56.10%	1,126	25.89%	64	5.38%
Mandal	11,764	7,354	62.51%	1,457	19.81%	66	4.33%
Radøy	3,687	2,459	66.69%	768	31.23%	42	5.19%
Re	6,870	4,384	63.81%	981	22.38%	61	5.85%
Sandnes	48,689	30,358	62.35%	8,193	26.99%	325	3.82%
Tynset	4,163	2,855	68.58%	903	31.63%	56	5.84%
Vefsn	10,456	6,161	58.92%	1,328	21.55%	58	4.18%
TOTAL	**167,506**	**104,374**	**62.31%**	**27,554**	**26.40%**	**1,224**	**4.25%**

The results of this comparison are quite consistent, with the number of cleansed votes in most municipalities being between 4 and 6 percent of the overall number of Internet votes counted. The only municipalities that have a lower percentage than this are Bodø and Sandnes, which are the larger municipalities and are only marginally below 4 percent. The real outlier is Bremanger, which has a high percentage of cleansed votes at 8.54 percent. However, Bremanger is a very small municipality with only 407 Internet votes. Its 38 cleansed votes are probably a statistical peculiarity of such a small amount of data.

[33] It is not possible to know why these multiple votes were cast, but it may have been that the voters wanted to change their original vote or that they were testing the possibility to change their votes using the new Internet voting system.
[34] See more details on this vote cleansed for other reasons in section 6 on the count and results process problems.
[35] All data presented here is from figures 1 and 3.

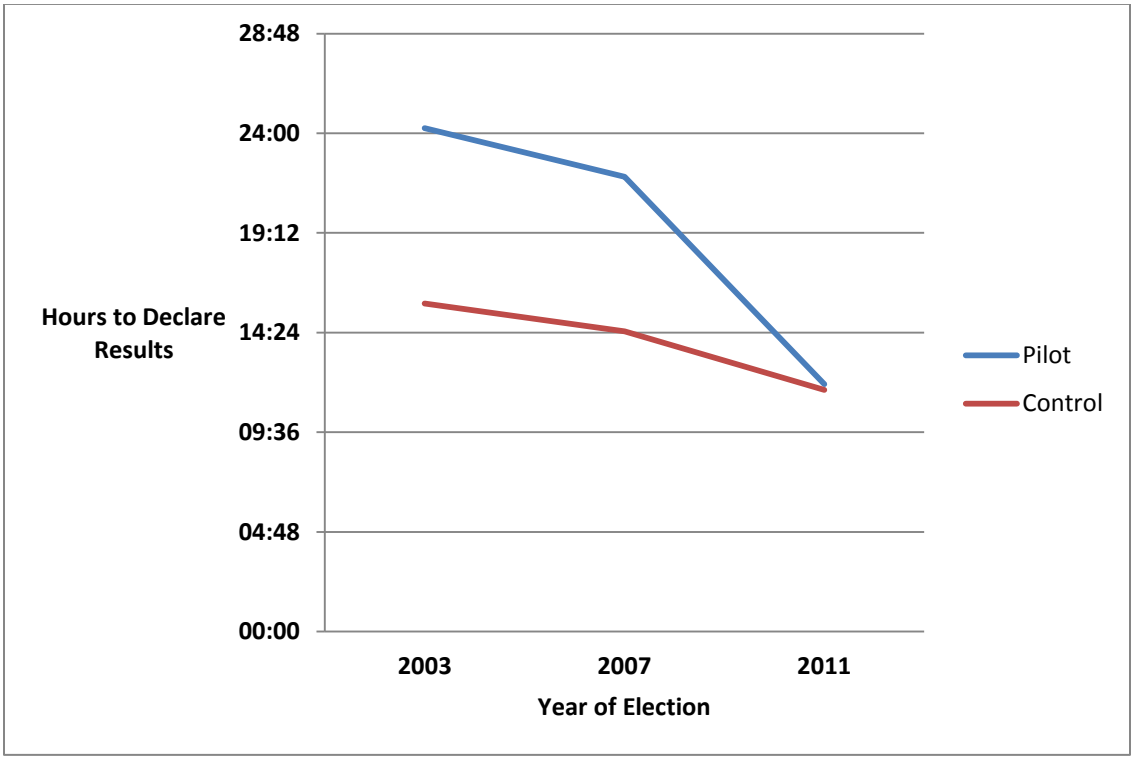
Quantitative Data

Declaration Time of Results

The declaration times for the pilot municipalities and the control municipalities have been collated for the 2003, 2007 and 2011 local government elections. The data collected is for the municipal elections only, and the declaration time is taken as the point at which both advance and polling station results are announced as final by the MEC. The time at which the polls in each municipality have been closed is used with this declaration time to calculate the duration of the count – the number of hours and minutes from the close of polls to the declaration of the final result. The data presented here is used to evaluate the impact of using Internet voting (the independent variable) on the speed of the counting and results process (the dependent variable).

The results of this analysis are shown below. Figure 6 shows the changes in the average time taken to declare results in pilot municipalities versus control municipalities over the 2003, 2007 and 2011 local government elections.

Figure 6 – Average Time to Declare Results for Pilot and Control Municipalities for the 2003, 2007 and 2011 Local Government Elections



Data from 2003 – 2011 shows that the time taken to declare results has decreased across the three elections, for both pilot and control municipalities. The decrease has been greater from 2007 – 2011, marginally so for control municipalities but much more dramatically for the pilot municipalities. This data seems to support the hypothesis that the use of Internet voting has led to a reduction in the time

taken to declare results. Data from the 2007 and 2011 election is now analyzed in more detail to further assess this hypothesis.

Figure 7 shows the declaration times and count durations for the pilot municipalities in the 2007 local government elections (at which time they were obviously no different from the control municipalities as they were not trialing Internet voting in this election). Figure 8 shows the same data for the control municipalities in the 2007 local government election. Figure 9 and 10 show the same data for the 2011 local government election.

Figure 7 – Duration of the Count in 2007 Local Government Elections - Pilot Municipalities[36]

Municipality	Eligible Voters (2011)	No. Polling Stations	Closing Time of Polls	Count Completion		Count Duration (hh:mm)
				Date	Time	
Ålesund	31,655	15	20:00	13/09/07	10:18	62:18
Bodø	34,731	12	20:00	10/09/07	22:09	02:09
Bremanger	3,006	8	20:00	11/09/07	09:33	13:33
Hammerfest	7,108	6	20:00	11/09/07	01:47	05:47
Mandal	10,837	6	20:00	11/09/07	14:11	18:11
Radøy	3,518	14	20:00	11/09/07	01:23	05:23
Re	6,270	6	21:00	11/09/07	02:01	05:01
Sandnes	44,786	13	21:00	14/09/07	08:58	84:58
Tynset	4,118	10	19:00	11/09/07	01:04	06:04
Vefsn	10,379	12	21:00	11/09/07	12:39	15:39
Total Hours						**218:03**
Average Hours						**21:54**

[36] Election Day for the 2007 local government election was 10 September.

Figure 8 – Duration of the Count in 2007 Local Government Elections – Control Municipalities

Municipality	Eligible Voters (2011)	No. Polling Stations	Closing Time of Polls	Count Completion		Count Duration
				Date	Time	
Austevoll	3,528	10	19:00	13/09/07	12:22	65:22
Fræna	7,084	7	20:00	11/09/07	18:54	22:54
Grue	4,111	7	20:00	11/09/07	01:08	05:08
Haugesund	26,485	11	20:00	11/09/07	01:20	05:20
Holmestrand	7,994	5	21:00	11/09/07	11:13	14:13
Høyanger	3,257	5	19:00	11/09/07	00:37	05:37
Karmøy	30,072	22	20:00	11/09/07	13:03	17:03
Kautokeino	2,289	3	20:00	11/09/07	02:48	06:48
Løten	5,869	7	20:00	11/09/07	10:29	14:29
Luster	3,720	10	20:00	11/09/07	15:46	19:46
Molde	19,410	9	20:00	11/09/07	15:01	19:01
Rana	19,841	9	21:00	11/09/07	20:32	23:32
Sande	6,461	5	20:00	11/09/07	08:01	12:01
Søgne	7,905	4	20:00	10/09/07	22:27	02:27
Sortland	7,499	9	20:00	11/09/07	03:12	07:12
Sør-Varanger	7,445	12	20:00	11/09/07	00:58	04:58
Sveio	3,798	6	20:00	11/09/07	06:21	10:21
Tysfjord	1,648	4	20:00	11/09/07	03:38	07:38
Vennesla	10,070	9	20:00	11/09/07	13:19	17:19
Vestvågøy	8,228	10	20:00	11/09/07	03:58	07:58
Total Hours						**289:07**
Average Hours						**14:27**

The data shows that the average time it took to declare final results in the pilot municipalities in the 2007 elections was 21 hours and 54 minutes from the close of polling, and in the control municipalities was 14 hours and 27 minutes. This is a significant difference, which may call into question the comparability of the pilot and control group. However, when looking at the data it is clear that both the pilot and control group of municipalities have outlier municipalities that take considerably longer than the rest to declare results, and therefore skew the average time for the group.

In the case of the ten pilot municipalities, eight of the municipalities declared results in less than 19 hours, but Sandnes took nearly 85 hours and Ålesund took 62 hours and 18 minutes. For the control group, 19 municipalities declared results in less than 24 hours, but Austevoll took over 65 hours. If you remove Sandnes from the calculation, then the average declaration times for both groups (which still

each contain a similar outlier at over 60 hours) have very similar average declaration times – 14 hours and 53 minutes for the pilot municipalities and 14 hours and 27 minute for the control municipalities.

Figure 9 – Duration of the Count in 2011 Local Government Elections - Pilot Municipalities[37]

Municipality	Eligible Voters (2011)	No. Polling Stations	Closing Time of Polls	Count Completion		Count Duration
				Date	Time	
Ålesund	31,655	12	20:00	13/09/11	20:07	24:07
Bodø	34,731	12	21:00	13/09/11	06:22	09:22
Bremanger	3,006	8	20:00	13/09/11	02:12	06:12
Hammerfest	7,108	6	21:00	13/09/11	03:37	06:37
Mandal	10,837	4	20:00	13/09/11	12:52	16:52
Radøy	3,518	4	20:00	13/09/11	00:28	04:28
Re	6,270	6	21:00	13/09/11	11:25	14:24
Sandnes	44,786	13	21:00	13/09/11	21:03	24:03
Tynset	4,118	10	19:00	13/09/11	01:19	06:19
Vefsn	10,379	6	21:00	13/09/11	03:49	06:49
Total Hours						**119:13**
Average Hours						**11:55**

[37] Election Day for the 2011 local government election was 12 September. Data on the number of polling stations and the closing time of the polls was received through email communications from each of the control and pilot municipalities. Data concerning declaration times was received from the Ministry by email on November 16, 2011 (2011 election declaration data) and on June 28, 2011 (2003-2009 election declaration time data).

Figure 10 – Duration of the Count in 2011 Local Government Elections - Control Municipalities[38]

Municipality	Eligible Voters (2011)	No. Polling Stations	Closing Time of Polls	Count Completion		Count Duration
				Date	Time	
Austevoll	3,528	9	19:00	13/09/11	15:22	20:22
Fræna	7,084	7	20:00	13/09/11	01:41	05:41
Grue	4,111	7	20:00	13/09/11	09:08	13:08
Haugesund	26,427	11	20:00	13/09/11	16:53	20:53
Holmestrand	7,994	5	21:00	13/09/11	05:17	08:17
Høyanger	3,257	5	19:00	13/09/11	11:19	16:19
Karmøy	30,072	22	20:00	13/09/11	03:02	07:02
Kautokeino	2,388	3	21:00	13/09/11	00:42	03:42
Løten	5,869	7	20:00	13/09/11	12:30	16:30
Luster	3,968	10	20:00	13/09/11	13:08	17:08
Molde	19,410	8	20:00	13/09/11	11:07	15:07
Rana	19,841	9	21:00	13/09/11	13:08	16:08
Sande	6,461	5	20:00	13/09/11	06:20	10:20
Søgne	7,905	4	20:00	13/09/11	03:32	07:32
Sortland	7,499	9	21:00	13/09/11	01:24	04:24
Sør-Varanger	7,445	12	20:00	13/09/11	15:10	19:10
Sveio	3,798	6	21:00	13/09/11	14:10	17:10
Tysfjord	1,653	4	20:00	13/09/11	02:57	06:57
Vennesla	10,070	9	21:00	13/09/01	00:19	03:19
Vestvågøy	8,228	10	20:00	12/09/11	23:47	03:47
Total Hours						**232:56**
Average Hours						**11:38**

The same data for the 2011 elections shows that for the pilot municipalities, the average time that it took to declare final results after the close of polls was 11 hours and 55 minutes, and for the control municipalities 11 hours and 38 minutes. This again, is very similar between the pilot and control municipalities.

Comparing the 2007 election data and 2011 election data, there are significant reductions in the time taken to complete the counting process, both for the pilot and control municipalities. Both pilot and control municipalities reduced the time taken for the count by nearly three hours.

[38] See footnote for figure 8 as to sources of the data presented here.

The average reduction in time taken to complete the counting and results process comparing the 2007 and 2011 elections was 2 hours and 58 minutes for the pilot municipalities and 2 hours and 49 minutes for the control municipalities. This is a small difference and it would be dangerous to read too much into this slightly larger reduction in counting time for pilot municipalities because of the small sample size. Therefore, on the basis of this declaration time data, it does not seem that the use of Internet voting (the independent variable) made a significant difference in the time it took to complete the counting and results process (the dependent variable).

A number of municipalities were questioned about the more general reduction in the time taken to complete the counting and results process from 2007 to 2011. A number of reasons were given, including the allocation of more staff to the counting process in 2011 (two municipalities), the use of more scanners for the counting process (one municipality), and technical glitches with the scanning of ballots in the 2007 election, which did not occur in 2011 (three municipalities).

The data on the time taken to complete the counting and results process was also analyzed to see if the size of the municipality, in terms of number of eligible voters, was correlated to the time it took to complete the results, and also to assess whether the use of Internet voting might have affected any such relationship. Figure 11 shows the data from the 2007 local government election, with the number of eligible voters in each municipality plotted against the minutes taken to complete the count and results process. Pilot and control municipalities are shown below.

Figure 11 – Number of Eligible Voters vs Minutes Taken to Complete the Results (2007 election, pilot and control municipalities)

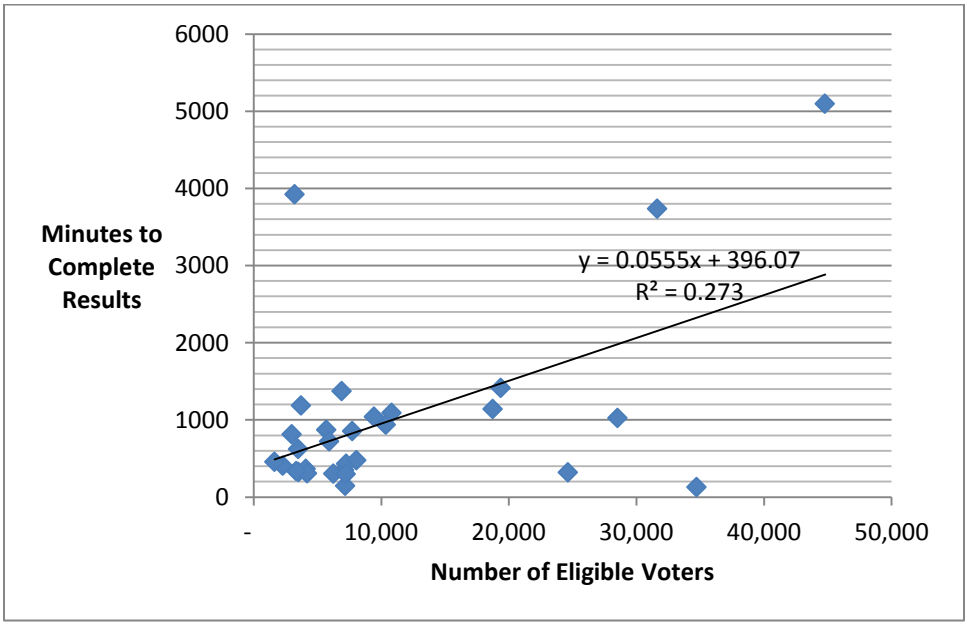


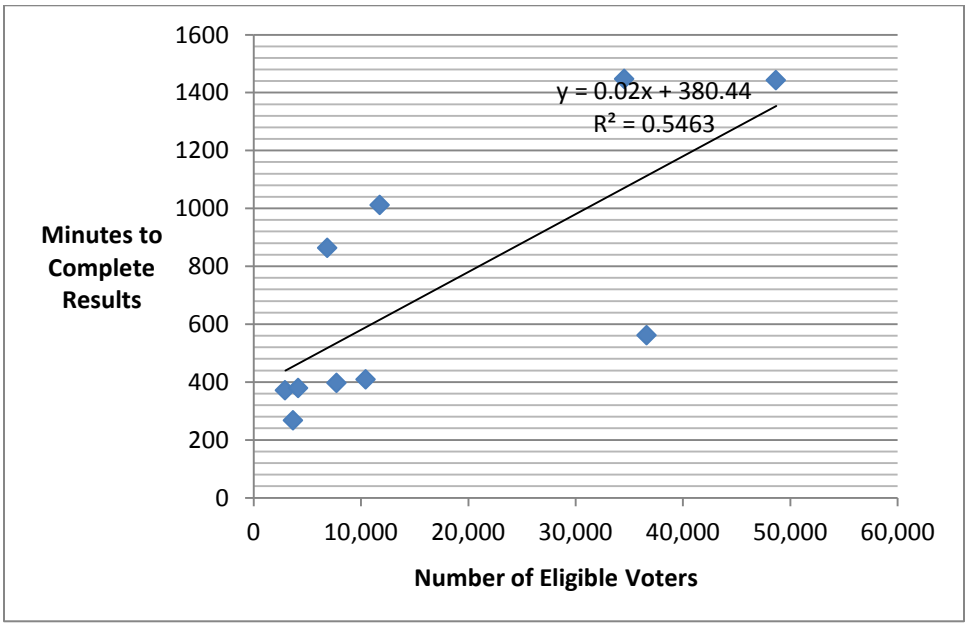
Figure 11 supports the intuitive hypothesis that larger municipalities take longer to complete the counting and results process[39] by showing a positive relationship between the number of eligible voters

[39] Due to the logistic challenge involved in counting and tabulating these votes.

in a municipality and the minutes taken to complete the counting and results process. The R^2 value (0.273) indicates a weak consistency with the line of best fit for the data, and there are a number of outlier values. The strength of the correlation is such that on average, with all other factors remaining equal, we would expect to see a 55 minute increase in the time taken to complete the results process for every 1,000 eligible voters.

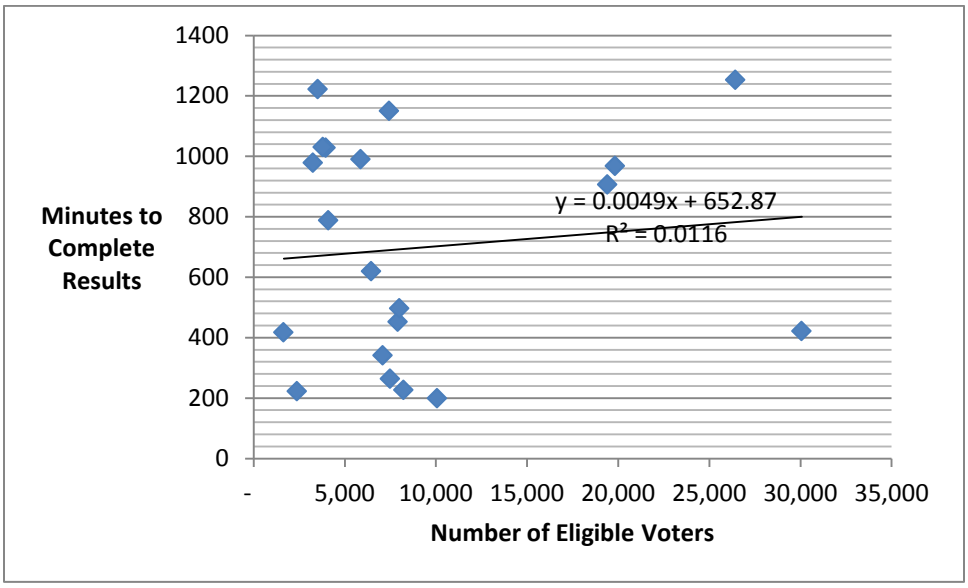
A similar analysis is conducted for the 2011 election, but analyzing the pilot and control municipalities separately. The line of best fit is shown in Figure 12 for pilot municipalities and Figure 13 for the control municipalities in the 2011 election.

Figure 12 – Number of Eligible Voters vs Minutes Taken to Complete the Results (2011 election, pilot municipalities)



The relationship between the number of eligible voters in pilot municipalities and the time taken to complete the count and results process in the 2011 election is again positive. And while the data is more consistent around the line of best fit (an R^2 value of 0.5463), the gradient of the line of best fit is less (0.02x compared to 0.0273x in the 2007 data) indicating a weaker relationship between these two variables.

Figure 13 – Number of Eligible Voters vs Minutes Taken to Complete the Results (2011 election, control municipalities)



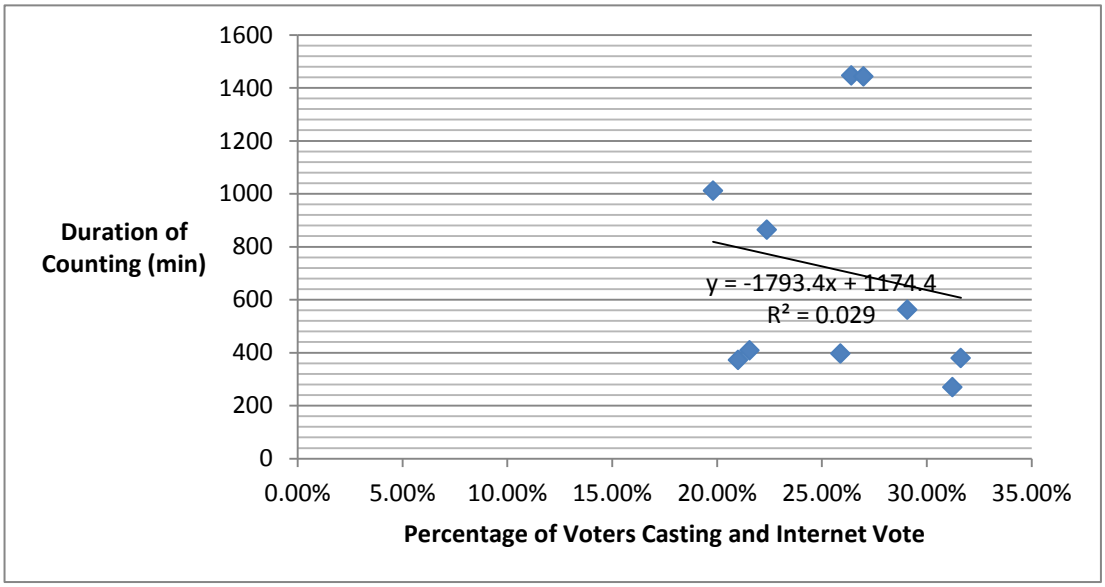
The analysis of control municipality data for the 2011 election is much more difficult. A weak positive relationship is shown between the number of eligible voters and the time taken to complete the counting and results process. However, the R^2 value for this line of best fit indicates that the data is very randomly scattered around the line. It is better, therefore, to categorize this data as not showing any relationship between the variables of municipality size (independent variable) and results declaration time (dependent variable).

The data on the relationship between declaration time and size of the municipality is inconsistent. While a relatively weak positive correlation between the two variables can be seen from the 2007 data in the municipalities analyzed, this relationship breaks down for the control municipalities in the 2011 election while getting stronger for the pilot municipalities. In fact, if the 2007 data for pilot and control municipalities is analyzed separately, very similar trends are seen to the 2011 data. The 2007 data shows a positive relationship between the number of registered voters in the municipality and the time taken to complete the counting and results process for pilot municipalities, showing no real relationship between these variables for control municipalities. Therefore, the differences found between pilot and control municipalities in 2011 do not seem to be a result of the use of Internet voting in the pilot municipalities.

The best conclusion to be drawn from this data is that while the size of the municipality may be one determining variable for the results declaration time of a municipality, it is likely that there are other determining factors, which have a much stronger influence on the declaration time. Such factors might include the remoteness of polling stations in a municipality, the resources allocated to the counting and results process, the method used for counting ballots, and any problems encountered in the use of counting technology. A general analysis of these factors is beyond the scope of this assessment, and the group of pilot municipalities is too small to conduct meaningful analysis of these variables within the pilot municipality group.

The time taken to complete the counting and results process was also analyzed against the percentage of Internet voters in the municipality. The hypothesis being analyzed was that the level of Internet voting usage in a municipality (independent variable) would have an influence on the time taken for the counting and results process (dependent variable). It was expected that any such relationship would be negative, with increasing levels of Internet voting usage leading to less time taken to declare results. Figure 14 shows this data.

Figure 14 – Relationship Between Percent of Internet Usage and Time Taken to Declare Results

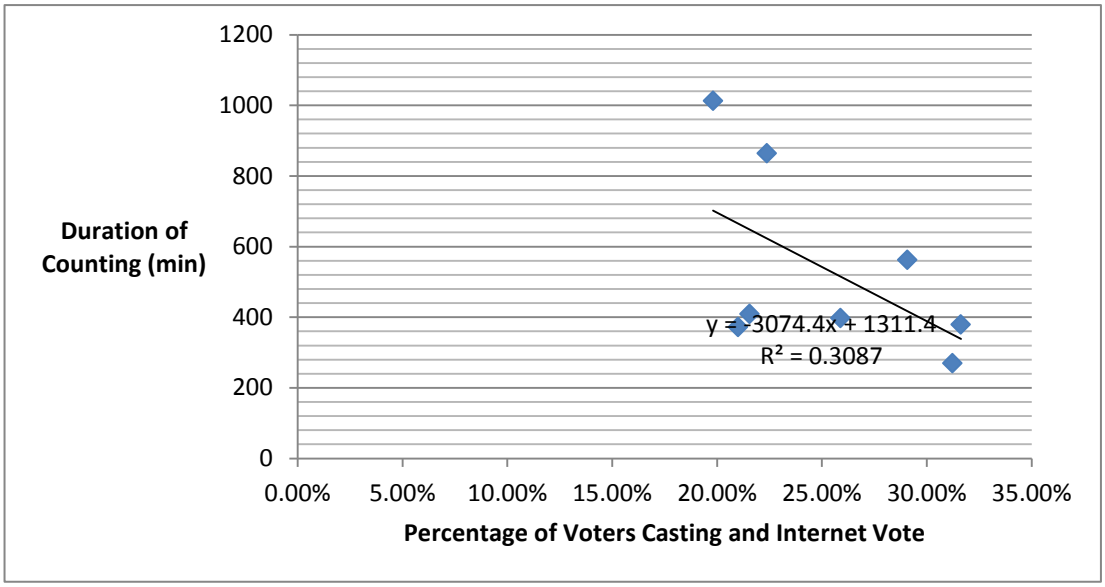


The line of best fit for this data shows a negative relationship between the level of Internet voting usage and the time taken to declare results, as expected. However, the R^2 value of 0.029 indicates that the data points are quite scattered around the line of best fit, with a number of outliers. Given the small number of pilot municipalities on which to base conclusions, a safer initial finding may be that the data does not show any relationship between the percentage of Internet voting usage and the time taken to declare results.

The scatter plot shows two data points, which are far above the trend line for the data set. These data points represent Ålesund (26.4 percent Internet voting usage and 1,447 minutes to declare results) and Sandnes (26.99 percent Internet voting usage and 1,443 minutes to declare results). The in-depth interview with Ålesund revealed that there had been problems with the scanning software on election night that caused delays in completing the counting and results process. It was not possible to determine if Sandnes also encountered other reasons for the delays in counting. Figure 15 below shows the results if these two data points are removed.

The absence of these outlier data points has the data showing a stronger correlation around the trend line (with an R^2 value of 0.3087) and a stronger negative relationship between the usage of Internet voting and the duration of the count. The data, excluding Ålesund and Sandnes, shows that for each percentage point of votes cast by the Internet, the time taken to complete the count and results process is reduced by 31 minutes, as opposed to 18 minutes for the complete pilot project data set.

Figure 15 – Relationship Between Percent of Internet Usage and Time Taken to Declare Results (without Ålesund and Sandnes)

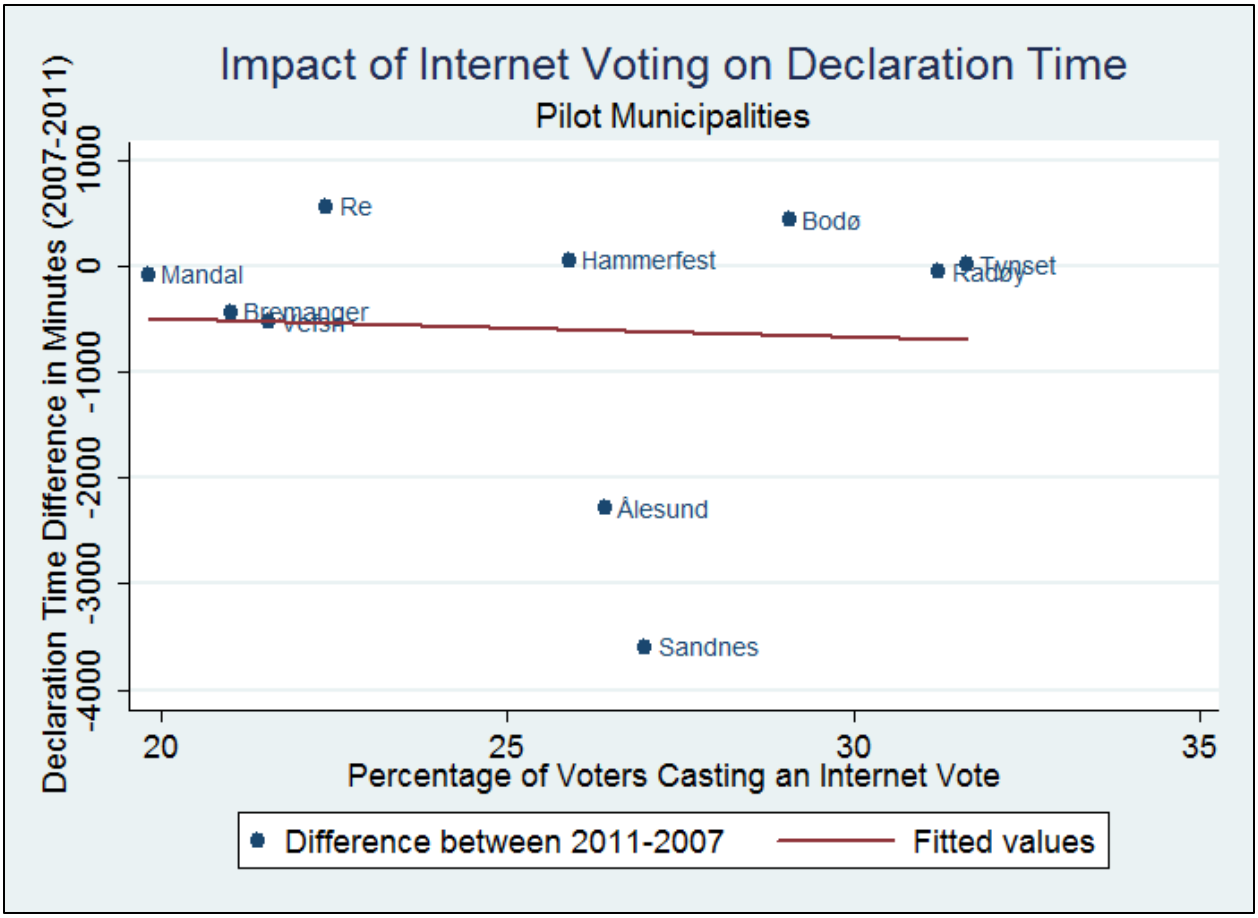


To establish causality, it is necessary to investigate the overall effect of the independent variable - Internet voting on the dependent variable - declaration time. To do this, we can regress the change in declaration time from 2007 and 2011, to the percentage of Internet votes cast in a municipality, controlling for number of votes.

$$\text{diffelec07\_11} = \text{declartion\%elec11} - \text{declaration\%elec07}$$
$$\text{diffelec07\_11} = \alpha + \beta 1 \cdot \text{Internet-turnout11} \cdot \text{totalvotes} + \beta x + \varepsilon$$

First it is necessary to confirm that the declaration times between 2007 and 2011 are related. When we compare the two numbers for pilot municipalities, we find that they share a strong correlation of .8567. The P-value is .002, indicating that we can be reasonably confident (to the 95% confidence level) that the 2007 declaration times are a strong predictor of 2011 declaration times.

Figure 16 – Impact of Internet Voting on Declaration Time



Next, the impact of Internet voting can be analyzed. Figure 16 demonstrates that based on the pilot project data there is no relationship between Internet voting and declaration time results. Although there is a negative coefficient (-16.66), the P-value of the relationship is very high, .882. The relationship remains weak if we control for number of voters in the municipality. If we factor this in, the P-value only drops to .0797 so that we cannot be confident of any relationship based on the pilot project data set. Although the small number of data points limits the usefulness of regression analysis, we cannot reject the null hypothesis that Internet voting has no discernible impact on declaration time. Data from 2007 remains the best predictor of declaration times in 2011, suggesting that endogenous factors are responsible for the results.

Invalid Ballots

Invalid ballots are ballots, which do not comply with the electoral rules in some respect or on which the intention of the voter cannot be determined. Under the Norwegian electoral system, ballot paper approval is detailed in section 10-3(1) of the Representation of the People Act (2002):

> *(1) A ballot paper shall be approved if:*
>
> *a) it bears a public stamp when it has been cast at election day,*

b) it is clear to which election the ballot paper applies,

c) it is clear for which party or group the elector has voted, and

d) the party or group has put up a list in the constituency. A ballot paper intended for another constituency may be approved only if it applies to a registered political party.

Ballot papers are invalid if they do not comply with these requirements. Invalid ballots are normally seen as a failure in the system due to mistakes in the administration of elections or in the way in which voters have interacted with the system in recording their votes. It should be the intention of election administrators to minimize the incidence of invalid ballots by implementing voting systems in which the involuntary invalidation of ballots is less likely to occur.

The level of invalid ballots is used in this assessment as an indicator of the quality of the counting and results process for Internet ballots compared to paper balloting. In principle, invalid Internet votes should not exist as the voting software should be designed so that making invalid ballot choices is not possible. However, as will be explained in the next section, there were a small number of problems that occurred in the pilot resulting in nine invalid and one rejected Internet votes being recorded.

To investigate the effect of Internet voting on invalid ballot rates, two different models are used: a difference of means test, and Ordinary Least Squares (OLS) Regression Analysis.

First, we will establish if pilot municipalities behaved differently than the rest of the country. Figure 17 shows the number of invalid ballots recorded in the pilot municipalities for municipal and county elections in 2011,[40] as well as the nationwide figures for invalid ballots in these elections.

The data shows that nationally, 0.13 percent of votes are invalid for municipal elections and 0.10 percent for county elections. Given that 26.4 percent of overall votes cast in the pilot municipality's municipal elections were Internet votes and 27.24 percent of pilot municipality's county votes were Internet votes, we would expect to see that a smaller number of invalid votes for the pilot municipalities (possibly in the region of 26-27 percent less). The number of invalid votes in the pilot municipalities is less than the national average and the reduction is actually much larger than expected, being in the region of a 50 percent reduction in invalid ballots for each election. It is not clear why this reduction is so large in the pilot municipalities, and this may be a statistical anomaly due to such a small dataset.

[40] This does not include the 10 invalid Internet votes, as one of them was cleansed during the Internet vote count process and the other nine were only discovered a month after the election during a review of the log files – information communicated by the Ministry by email on 28 November 2011.

Figure 17 – Number of Invalid Ballots (Municipal Elections 2011)[41]

	Municipal Elections			County Elections		
Municipality	**Total Number of Votes Cast**	**Number of Invalid Votes**	**% Invalid Votes**	**Total Number of Votes Cast**	**Number of Invalid Votes**	**% Invalid Votes**
Ålesund	20,580	13	0.06%	18,908	11	0.06%
Bodø	23,936	13	0.05%	22,749	6	0.03%
Bremanger	1,938	3	0.15%	1,774	1	0.06%
Hammerfest	4,349	12	0.28%	3,772	0	0.00%
Mandal	7,354	5	0.07%	6,408	16	0.25%
Radøy	2,459	0	0.00%	2,186	0	0.00%
Re	4,384	5	0.11%	4,007	0	0.00%
Sandnes	30,358	12	0.04%	29,296	0	0.00%
Tynset	2,855	3	0.11%	2,387	2	0.08%
Vefsn	6,161	4	0.06%	5,500	7	0.13%
Pilot Total	**104,374**	**70**	**0.07%**	**96,987**	**43**	**0.04%**
Nationwide	**2,440,428**	**3,277**	**0.13%**	**2,271,152**	**2,312**	**0.10%**

To further investigate if there is any causality, a second model is used, which estimates the overall effect of Internet voting on invalid ballot rates. To do this, we can regress the change in invalid ballots from 2007 and 2011, to the percentage of Internet votes cast in a municipality.

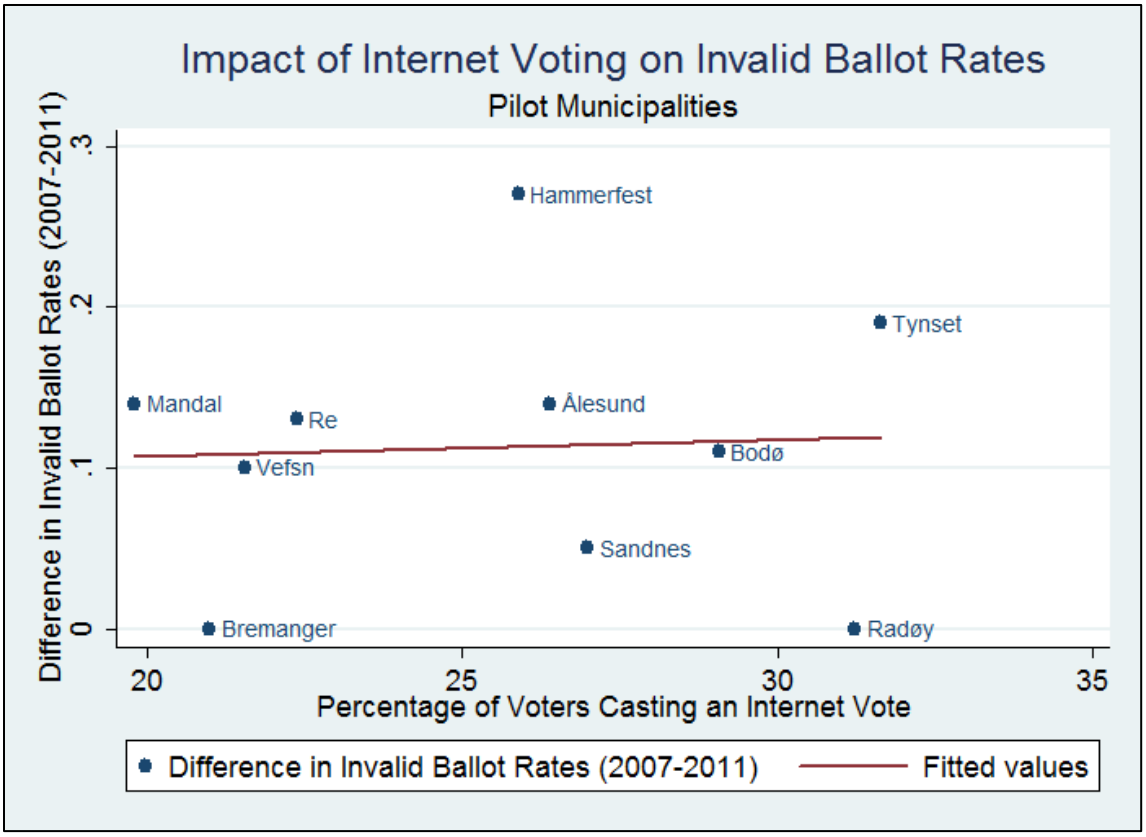
$$\text{diffelec07\_11} = \text{invalid\%elec11} - \text{invalid\%elec07}$$
$$\text{diffelec07\_11} = \alpha + \beta 1\ (\text{i-turnout11}) + \beta x + \varepsilon$$

If higher Internet turnout did not affect invalid ballot rates, this would indicate the presence of a substitution effect, with Internet voters replacing those voters who would have cast a valid vote in the first place. If higher Internet turnout, however, was related to lower invalid ballot rates, this would suggest Internet voting was causing some voters, who would otherwise cast an invalid ballot, to cast a valid one. This equation assumes that invalid ballot rates across the two elections are closely related. This is easily demonstrated as the invalid ballot rates for both years share a P-value of .001, with a low coefficient of .499. Combined with an R^2 of .76, we can show that the number of invalid ballots in 2007 is a strong predictor of the number of invalid ballots in 2011.

Figure 18 shows there is little relationship between Internet turnout and the invalid ballot rate. There is a weak coefficient of .00096, indicating that the Internet had a marginal impact on valid ballots. Furthermore, with a P-value of .892, we cannot reject the null hypothesis that the impact of Internet voting on invalid ballot rates is zero.

[41] Sources - http://www.regjeringen.no/krd/html/valg2011/bks.html and http://www.regjeringen.no/krd/html/valg2011/bfs.html [both last accessed on February 15, 2012].

Figure 18 – Impact of Internet Voting on Invalid Ballot Rates



As with measuring declaration time, the number of data points limits the usefulness of regression analysis. With this in mind, it is still useful to note that we could not reject the possibly that Internet voting had no impact on invalid ballot rates. Data from 2007 was a far better predictor of 2011 numbers than any exogenous variable and the low number of invalid ballots from both years suggests that it would be difficult for Internet voting to make a very significant impact on our dependent variable.

Complaints

According to the Norwegian legal framework, a complaint (referred to as an 'appeal' in the law) may be lodged against, "matters relating to the preparation and conduct of the election." In effect, this means that complaints can be lodged against circumstances of all types relating to the conduct of the election. Complaints are required to be lodged no later than seven days after election-day. Complaints related to municipal elections are lodged with the MEC and complaints related to county elections are lodged with the CEC. In the first instance, the respective electoral committee, the MEC or the CEC, reviews the complaint and decides if it should be upheld. If the complaint is not upheld, it is sent to the Ministry for review. The Ministry's decision on the case is final, with no possibility for judicial review of its decision.[42]

[42] For more information on the complaints process see Chapter 23 of the Ministry's Election Manual: Overview of Election Rules.

The MECs in the pilot and control municipalities were contacted to determine whether complaints, which related to the counting and results process had been received by them. MECs were also asked to indicate whether any of these complaints had been upheld. One complaint was received in the pilot municipalities and one received in the control municipalities. However, these complaints were not related to the counting and results process (or the Internet voting process) and were not upheld by the MECs.[43]

Given that the pilot and control municipalities received no complaints about the counting and results process, no conclusions about comparative quality of the Internet counting and results process vis-à-vis the hand counting and ballots scanning processes can be drawn based on complaints about the systems.

The fact that no complaints were received is an indication that there is significant level of trust in the counting and results process, Internet or otherwise.

Local Democracy Survey Results

The local democracy survey has been conducted after every local election in Norway since 1995, and seeks to identify citizen's behavior and attitudes towards local democracy. In 2011, the survey was commissioned by the Institute for Social Research, Uni Rokkan Centre and the University of Oslo. The survey started within a week of the local election in September 2011. Telephone interviews were conducted, after which participants were mailed follow-up postal questionnaires to be completed online or returned by post.

A stratified sample was used for the survey, with 834 eligible voters for each of six selected strata. The strata were based on the population size of the municipality. Out of the 5,004 total voters selected, 1,773 voters (35 percent) answered the telephone survey, and 984 answered the postal/web-survey. The data results (on the national level) were weighted to counterbalance the effect of the stratified design.

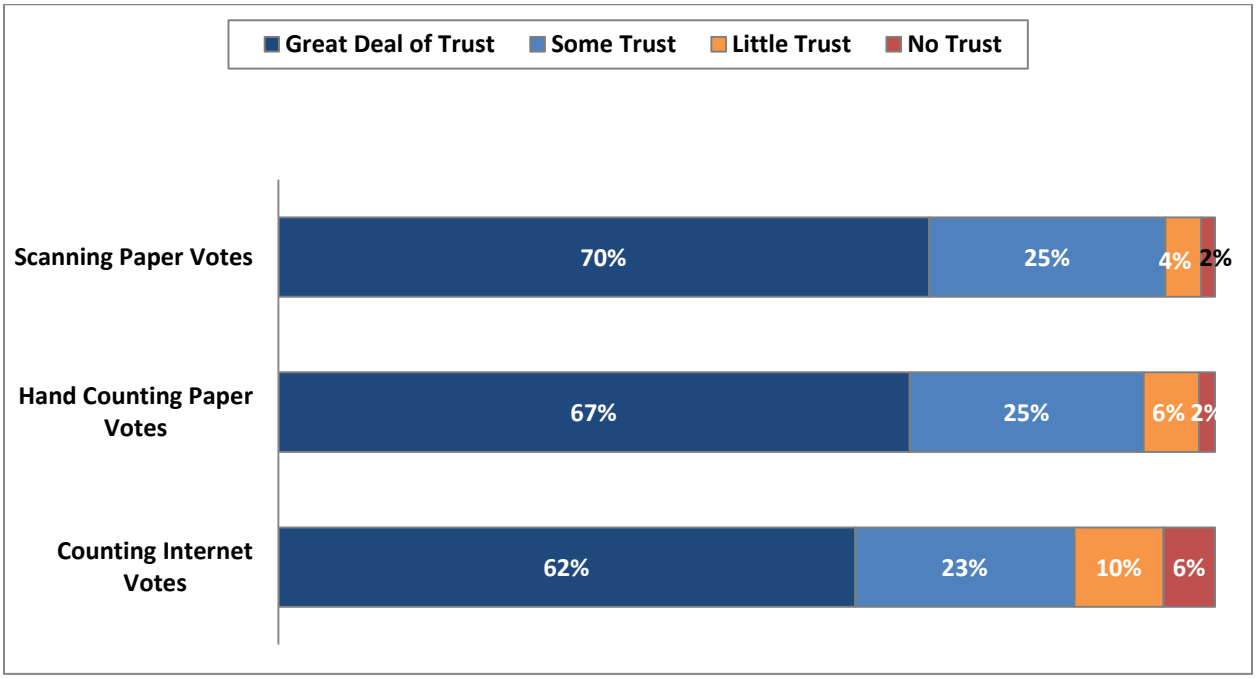
The following question was included in the local democracy survey to assess the relative trust in the counting of Internet ballots:

> *Listed below are three methods used for counting votes in the election this fall. For each method, please indicate whether you have no trust, little trust, some trust, or a great deal of trust in the method.*
>
> *1) Hand counting of paper ballots*
>
> *2) Electronic counting of paper ballots that have been scanned (read electronically)*
>
> *3) Electronic counting of votes cast through the Internet*

[43] One voter in Stavanger complained that he was not able to cast a vote in Stavanger for the County Election when he was registered to vote in another municipality in the county. One voter in Ålesund complained that the party list he wished to vote for was missing in the election booth. Eleven voters had already voted before the complainant. The electoral committee determined that even if all 11 voters had voted for the party whose list was missing it would not have affected the election result, therefore the complaint was rejected.

The data collected from this question is shown below in figure 19:

Figure 19 – Local Democracy Survey Results – Trust in Counting of Internet Ballots (Aggregate)



In total, more than eight in ten Norwegians say that they have either a great deal of trust (62%) or some trust (23%) in the counting of Internet votes. Less than two in ten Norwegians say they either have little (10%) or no trust (6%) in the Internet count method. The percentage expressing a great deal or some trust in counting of votes cast through the Internet is only slightly lower than for hand counting of votes (67% and 25%, respectively) or electronic counting of paper ballots (70% and 25%, respectively).

The relatively high levels of trust expressed in all three methods of vote counting may reflect a generally high level of trust in the election process in Norway. Still, it is instructive that electronic counting of votes cast through the Internet generates a relatively high degree of trust even though it was implemented for the first time in elections on 2011.

High levels of confidence in the Internet may in part be due to the high degree of Internet use in Norway. In the survey, 75 percent of Norwegians report using the Internet on a daily basis and the data from the survey indicates that trust in Internet counting of votes correlates with the frequency of Internet use. In general, the percentage of Norwegians who say that they have a great deal of trust in the counting of Internet ballots rises with the degree to which they use the Internet. Among those who use the Internet on a daily basis, 66 percent say they have a great deal of trust in Internet voting and 13% say they have little or no trust. In comparison, 46 percent of those who use the Internet on a weekly basis or lesser frequency say they have a great deal of trust in Internet counting of votes and 23% say they have little or no trust.

Age also plays a role in the level of trust placed in different methods of counting ballots, as shown in figures 20-22 below.

Figure 20 – Local Democracy Survey Results – Trust in Hand Counting of Ballots (By Age Group)

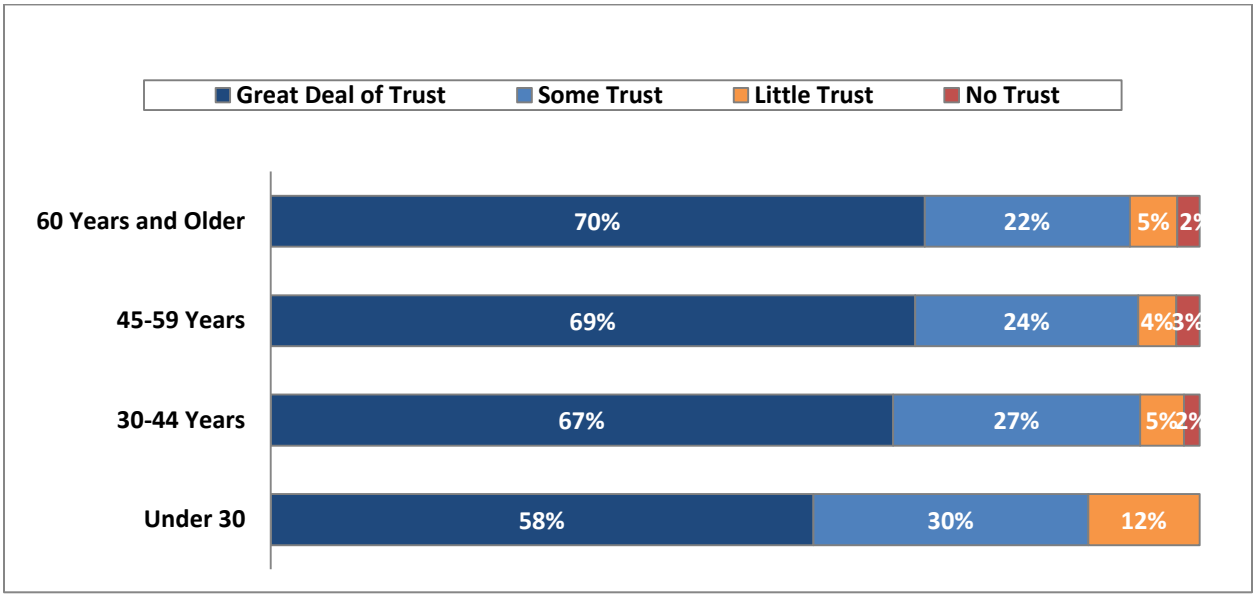


Figure 21 – Local Democracy Survey Results – Trust in Counting of Scanned Ballots (By Age Group)

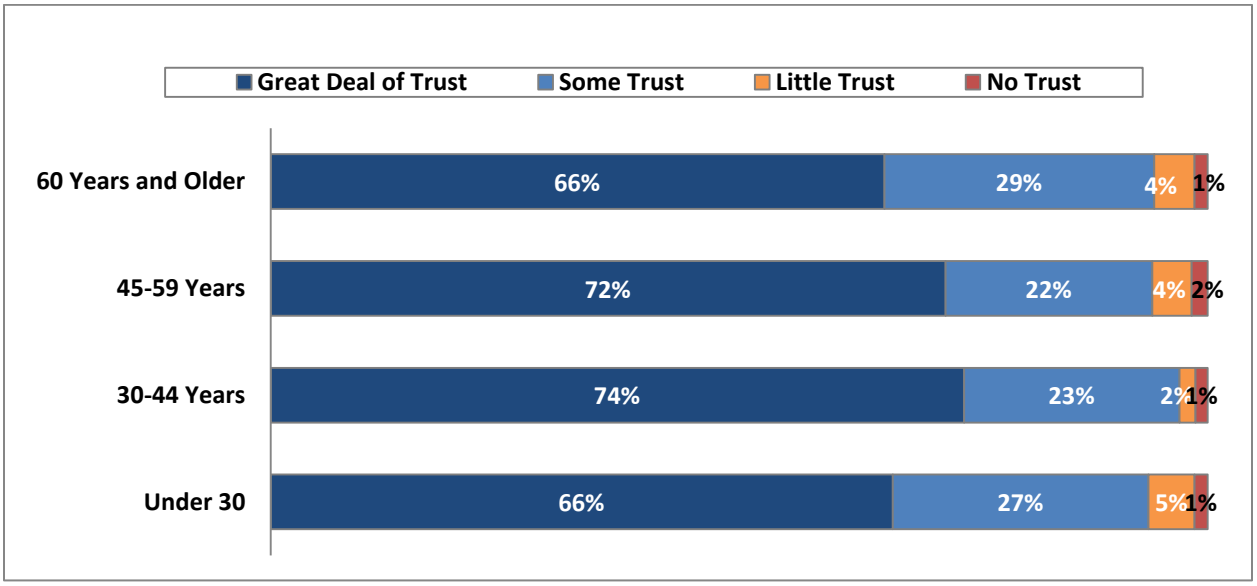
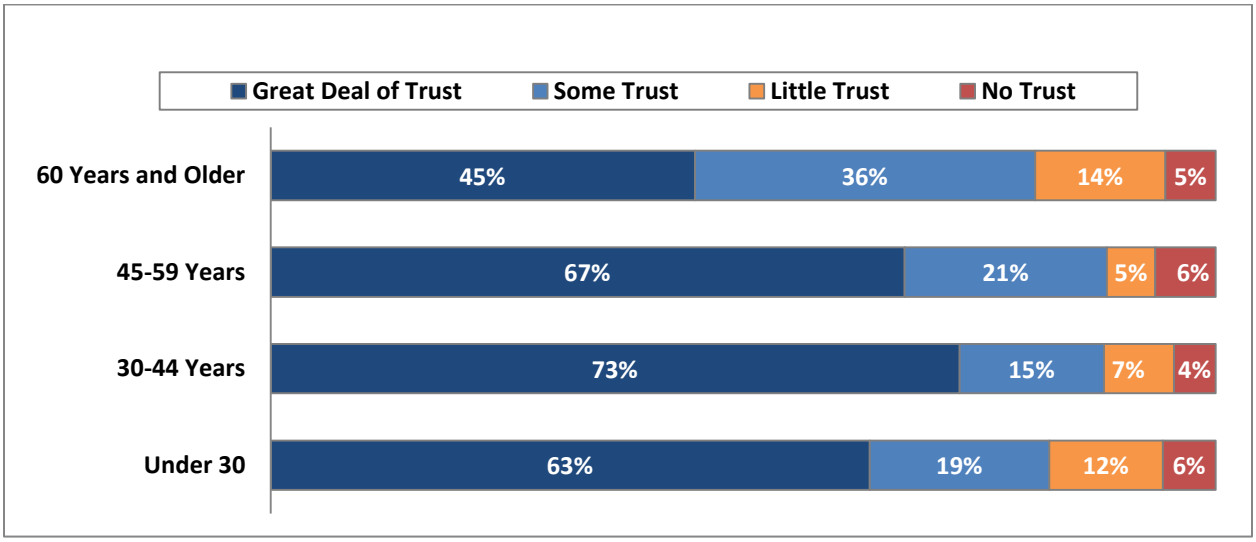


Figure 22 – Local Democracy Survey Results – Trust in Counting of Internet Ballots (By Age Group)



The data shows that the relationship between age and trust in the counting of Internet ballots is not linear; younger and older age groups express the most skepticism, while middle age groups show higher levels of trust. Among the youngest age group (under 30), 63 percent express a great deal of trust in the counting of Internet ballots. In comparison, 73 percent of those aged 30-44 have a great deal of trust in this counting process, while a slightly lower 67% have similar levels of trust among those aged 45-59. Trust falls off significantly in the oldest age group (60+) where only 45 percent express a great deal of trust. These over 60 years old have the highest degree of trust in the counting of paper votes, both manually and electronically (70% and 66%, respectively), but lack a similar degree of trust in counting Internet ballots.

In the case of those 30-44 year olds or 45-59 year olds, the degree of trust in the counting of Internet ballots is similar to levels of trust in the counting of paper ballots manually (67% and 69%, respectively) and electronically (74% and 72%, respectively). For the youngest age group (under 30) trust in electronic methods (scanning of paper ballots and counting of Internet ballots) is actually higher than manual counting of paper ballots. Only 59 percent of those under 30 express a great deal of trust in the hand counting of paper ballots while 66 percent express the same in electronic counting and 64 percent in Internet voting. The fact that a large percentage of older Norwegians have a high degree of trust in the electronic counting of paper ballots, but not the nearly the same degree of trust in the counting of Internet ballots, indicates that their concerns may be related to the fact that voting is conducted through the Internet, and not that votes are counted electronically per se.

Focus Groups and In-Depth Interviews

With the assistance of the Norwegian research company, NORSTAT, IFES conducted three separate focus groups in Oslo from October 5-6, 2011. Two of the focus groups (1 and 2) were held with political party representatives at the local level. The two groups of local stakeholders consisted of participants from all of the pilot municipalities except Bremanger. Focus Group 3 was held with national-level stakeholders. This included three party representatives (The Socialist Left Party, the Liberal Party and

the Conservative Party), and two civil society organizations (The Norwegian Center for Human Rights and the Helsingfors Committee).

Figure 23 – Topic A4 Focus Groups

Focus Group	Date	Location of Focus Group	Participants	Number of Participants
1	October 5, 2011	Oslo	Local stakeholders	8
2	October 5, 2011	Oslo	Local stakeholders	5
3	October 6, 2011	Oslo	National Stakeholders	7

The participants in the focus groups agreed to participate on the understanding that any opinions expressed in the focus groups would be used in the assessment of the counting and results process, but would not be presented so as to attribute comments to specific participants. Therefore lists of the participants are not provided in this report. Some understanding of the background of the participants is important to contextualize comments made in the focus groups.

The two local stakeholder focus groups consisted of local politicians from the Internet voting pilot municipalities. They were recruited on the basis of their position on the electoral lists for the municipal elections in 2007 and 2011. This criterion ensured that the participants possessed knowledge of experiences with the implementation of the Internet voting system and with the existing methods for counting the paper ballots. Another criterion was whether the local stakeholders had a prominent political position in the municipality, such as mayor, deputy mayor or a member of the Presidency of the municipality. It was desirable to recruit participants from these positions due to the likelihood of a greater understanding and involvement in the election process. Only candidates from the largest parties in terms of support, either in position or opposition, were asked to participate in the focus groups. This condition ensured that participants had real influence on decisions made by the municipal council in the previous period.

On the basis of these selection criteria, the actual participants in the two focus groups with local stakeholders consisted of several members of the Presidency of the pilot municipalities, mayors and deputy mayors, some with many decades of experience on voting boards, election committees, in polling stations and in the general administration of elections. All participants were politically active; some were active in the 2011 local government election.

The focus group of national stakeholders contained members with a different profile, consisting of three national representatives of the political parties in the parliament and four civil society representatives who had observed previous elections. While the election observation organization representatives had experience of election processes at a local level, none of the political party representatives indicated a strong knowledge or involvement at this level of the electoral process in the past. The political party representatives were from three of the main political parties in Norway, from government and opposition benches. All of the political party representatives were part of the political reference group

established by the Ministry for the Internet voting project, and one was an encryption key holder for the Internet ballots.

In-depth interviews were scheduled to take place with election administrators from each of the pilot project municipalities, and happened from October 5-31. Interviews took place with all but one of the pilot municipalities, which did not respond to requests for the interview.

Methodology

In-Depth Interviews: Interviews were requested with the election administrators in each of the pilot project municipalities, and in many cases took place with the senior election administrator in the municipality. The interviews were conducted in Norwegian and followed a semi-structured methodology. The questions asked to each administrator are attached in Annex 4.

Focus Groups: The focus groups were arranged with the assistance of the Norwegian firm NORSTAT. Three focus groups were planned, two with local stakeholders from the pilot municipalities and one with national stakeholders. It was hoped that both political and civil society representatives would be included in all of the focus groups, but the lack of any domestic observation of the local elections meant that no suitable civil society organizations could be found for the local stakeholder focus groups. The national stakeholder group did include representatives from civil society. The focus group discussion guide is included in Annex 5 of the report.

Objectives

The main objective of the focus groups and in-depth interviews was to collect the impressions of the Internet voting pilots from key stakeholders involved in the election process in the pilot municipalities. Specifically, the focus groups explored stakeholder's familiarity and level of confidence in the existing counting and result tabulation process and the counting process for the Internet voting system. Security provisions, information about the process, and transparency of the process were central topics covered in the focus group discussions. The focus groups provided information to assess levels of confidence and acceptance of the Internet vote counting and result tabulation processes among key groups of stakeholders, on both local and national levels.

The main objective of the in-depth interviews was to assess how easy election staff found the administration of the existing counting and result process and to assess their thoughts on the counting of Internet votes. Another essential issue addressed in the interviews is the mechanisms in place for stakeholders to oversee the counting and result process, how easy they were to understand and implement, and to what extent stakeholder access was provided to these oversight mechanisms.

The interviews also covered the interviewees' experience with past and existing forms of result tabulation and counting, manual and electronic, of paper ballots. Their experience with existing forms of counting ballots is compared with their experience with electronic counting of Internet votes, and they were asked to rank and reflect upon the strengths and weaknesses of different methods in terms of transparency and accuracy in generating the correct results.

Summary of Focus Groups – Pilot Municipality Stakeholders

Integrity and Organization of the Election Process

Respondents generally indicated they have trust in the electoral process although there are some areas for improvement. Notably, there was some debate over whether it was optimal to have politicians in the polling stations and what could be done to improve the low voter turnout[44]. It was also noted that an international observation mission pointed out some flaws, such as inconsistent folding of ballot papers.

Existing Transparency Mechanisms

While most respondents in one focus group had trust in the self-policing nature of vote-counting, others noted that the previous lack of a requirement to seal the ballot boxes was a serious flaw, even if no fraud was known to have occurred as a result.

Confidence in the Counting of Paper Ballots

Respondents had mixed opinions on whether scanning or hand-counting was the optimal method of counting. Some expressed the belief that scanners frequently missed things the human eye could catch, such as ballots with incorrect printing. Others noted humans were very prone to mistakes, especially after counting ballots all night. It was noted that a mix between the systems was preferable for accuracy, although it could delay the counting process.

Opinions on Internet Voting

Participants generally had a positive view of the Internet voting pilots, with some even mentioning that they switched from being skeptics to believers. Several areas for improvement were mentioned. A number of participants suggested that Internet voting should have been extended until Election Day and that some voters did not realize beforehand that it was not. Others recommended enhancing the browser compatibility of the Internet voting system as some users had trouble downloading Java. It was mentioned that the Ministry did not provide enough information on the system and the party representatives had to inform their supporters. It was noted that many voters had questions about using MinID.[45]

Transparency Mechanisms for Internet Voting

One participant was very concerned about the secrecy of Internet voting, noting that the mother of a citizen with a disability was de facto given two votes.

Most participants believed that tendency to vote was based on other factors and that Internet voting had no impact on turnout.

[44] In this regard it is worth noting that in Spring 2011 a change was made to the election law limiting the tasks that list candidate may have in the implementation of an election. *"This will mean that list candidates will no longer be eligible for election onto polling committees and that they may no longer serve as returning officers or election officials. The reason for the amendment in legislation is that it is in principle unfortunate that candidates who are themselves standing for election come into direct contact with voters in the polling situation"* (Ministry of Local Government and Rural Development, Election Manual: Overview of Election Rules, page 10-11).

[45] MinID was one of the three mechanisms authorized for the authentication of voters using Internet voters. MinID is a personalized log-in system for accessing online public services from the Norwegian public sector – see http://minid.difi.no/minid/minid.php?lang=en [last accessed on March 5, 2012].

To improve transparency, it was suggested that maybe one would have to pick up an electronic code at a designated location. Others countered that the system needs to be as simple as possible to have the desired effect. One participant noted that it was strange people assumed the current system was completely flawless.

Participants generally had no problem with Internet votes being counted at a central location, although one participant noted that people became insecure after the county had to count the ballots three separate times without providing an explanation.

Ranking of Counting Methods
Opinions on the optimal form of counting (hand counting, ballot scanning or tallying of Internet votes) were mixed, although seven listed internetvoting as the most accurate. Generally, the reason given was that it was impossible to make a mistake with the counting of Internet votes it. This is not the case with hand counting or ballot scanning.

Further Development of Internet Voting
Participants seemed confident that Internet voting was here to stay and most were content that this was the case. It was mentioned that this provided opportunities to hold more local referendums, but two individuals (from two different groups) expressed concern that it could lead to an inflation of plebiscites that became glorified public opinion polls.

Summary of Focus Groups – National Stakeholders

Integrity and Organization of the Election Process
National-level stakeholders had a high degree of confidence in Norway's electoral operations. They believed voters had confidence in the system, and that the process was transparent and auditable.

Existing Transparency Mechanisms
National-level stakeholders did not provide as much detail on existing transparency mechanisms as their local counterparts. They all agreed that Norwegians had a high degree of confidence in the system. One participant noted that the decentralized nature of the system was partially responsible for this trust. Another noted that it was because the process was run by lay people from across the political spectrum.

Suggestions for improving the transparency of the existing system included increasing the number of election observers and requiring that every ballot box be sealed. It was also noted, with concern, that in some municipalities, candidates are in polling stations and allowed to handout party lists outside the polling stations.

Confidence in the Counting of Paper Ballots
While acknowledging some room for error in manual counting, most participants believed it was easier to verify, and therefore, very accurate. The group also agreed that the checks and balances in the counting system, and the mix of scanners and hand-counting, only further strengthened the security. Compared to the local-level groups, issues related to the speed of counting were not brought up.

Opinions on Internet Voting

Compared to the local-level groups, opinions of Internet voting were skeptical to negative. It was mentioned that this was a solution in search of a problem, and most participants felt it was not necessary. The most cited concerns were that the average person could not understand (and therefore monitor) the system; in the instance of a close election, Internet voting could threaten the perceived accuracy of the results.

Ranking of methods

When it came to ranking the counting systems in order of confidence, all but one participant (who declined to rank the systems) listed 1) manual, 2) scanning, and 3internet voting. It was noted that manual counting could be repeated, and therefore, was the most safe.

Further development of Internet voting

Some respondents wanted more data to make a conclusion about the desirability of continuing the Internet voting project. Others, however, felt that the project should be closed, and that the real cause of low turnout should be identified.

Focus Group Conclusions

While participants at the local level expressed reserved optimism about the Internet voting process, national-level stakeholders were unanimously against the project. Responses from local stakeholders demonstrated greater knowledge of the process. They also noted that the current, traditional method of voting had flaws in it as well. Suggestions for improvement included both simplifying the system, and adding an extra verification step to improve transparency.

National and local-level stakeholders agreed that Internet voting was not a solution to improving voter turnout. All of the participants in the three focus groups think that if Internet voting is continued, it should become a universal channel for voting within the country at all levels of elections, and not one that is available to only select parts of the country. They also all saw Internet voting as a supplemental way of voting in the future, if it is going to be continued at all, and not a replacement for paper balloting for those who wish to use it.

Summary of In-Depth Interviews

Confidence in the Counting of Paper Ballots

Opinions were mixed on the accuracy of different counting methods. Most had overall confidence in both systems, although reservations were expressed about each one. It was noted that humans can make mistakes, but this could be resolved by counting more than once. One respondent said they noticed over 100 errors when they scanned ballots for a second time in the previous election. All respondents noted they scan ballots several times, but the fact that errors were detected was troubling.

Existing Transparency Mechanisms

With the exception of one municipality, respondents noted that there were no electoral observation missions in their municipalities for the 2011 elections, although the MEC did supervise the counting

process. The election observers witnessed the scanning of advance votes and visited different polling stations in the municipality.

All respondents noted that media interest, if present at all, was more concerned with the results than the actual vote-counting process. Areas that also piloted the youth voting project noted that this received more attention than Internet voting.

Opinion on Internet Voting

Respondents all viewed the introduction of Internet voting as a positive development. Most mentioned that they received mostly positive feedback from local residents. Supporting claims from the focus group, one mentioned issues with using Java, while others mentioned the difficulty for those who didn't have MinID.

In two municipalities, election administrators noted that Internet voting was seen as something positive because many voters live in remote locations. The municipalities have a population spread over large distances. One interviewee stated that they wanted to be a part of the project precisely because their voters live the way they do.

Respondents did not believe Internet voting increased turnout, despite receiving feedback that it greatly improved the ease of voting for busy individuals. One respondent noted that most 16 and 17 year olds preferred to cast a paper ballot. The respondent speculated this was because in their first election they wanted to experience the traditional polling station experience.

Transparency Mechanisms for Internet Voting

While everyone accepted the return code, one respondent noted they believed most people did not even verify if it was correct. The simple act of getting the code, they believed, created confidence. One respondent, however, noted that a voter received an incorrect return code.

Respondents noted that most voters either accepted, or did not question the security of the system. One respondent speculated that those who questioned its security probably did not vote through the Internet.

Comparative Levels of Trust in Counting Mechanisms

Respondents universally place higher confidence in Internet voting, or scanners, as a means to count votes. The possibility of human error was always cited as the reason for considering hand-counting as the least reliable method. It was mentioned that with Internet voting all votes were clearly cast and there was no risk of casting a ballot, which would be rejected. The same interviewee, however, mentioned that they were very surprised that eight or nine Internet votes were rejected nationwide because they were invalid when decrypted. If Internet voting is flawless in terms of errors, this should not be possible.

One respondent expressed a desire to have Internet votes counted in their town hall, rather than a remote location. Most respondents trusted the centralized count, with some expressing that they had not even considered it as a concern.

Future Use of Internet Voting

Two interviewees suggested a more phased development of Internet voting, starting with introducing Internet voting in the controlled environment of the polling station to build confidence in the system. They envisioned that people would become more familiar with the concept and the system this way and at the same time, would meet the concerns of those who fear that Internet voting reduces the secret ballot and free elections.

Respondents believed the delays in receiving the results for the Internet ballots needed to be addressed in the future. There was an expectation that Internet voting would lead to quicker results. When it actually took longer, these delays caused negative reactions amongst voters, the media and the administration.

Questions on Resource Allocation

To help assess the efficiency of the counting process for Internet votes compared to traditional methods of counting votes, the project team asked both the municipal election administrations and the Ministry a number of questions on the resources that they allocated to the counting and results process for the 2011 election.

Questions to Municipalities

Two questions were posed to pilot and control municipalities about the resources that they used for the counting and results process. Only eight of the ten pilot municipalities provided response to these questions (Bremanger and Sandnes did not respond) and 17 of the 20 control municipalities provided responses (Haugesund, Sveio and Sør-Varanger did not respond). The information provided was as follows:

How many staff were used for the counting of results at the municipality level

Figure 24 – Resources Allocated to Counting by Pilot Municipalities (2011 Election)[46]

Municipality	Eligible Voters (2011)	No. Staff on Counting at Municipality	Count Duration (mins)
Mandal	11,979	6	1012
Vefsn	10,481	6	409
Hammerfest	7,772	7	397
Radøy	3,704	7	269
Re	6,880	7	864
Tynset	4,171	11	379
Ålesund	34,606	15	1447
Bodø	36,707	18	562
Total	**116,300**	**77**	**5,338**

[46] Information on the number of counting staff employed at the municipal level was provided by election administrators in the municipalities in a series of questions sent to each pilot and control municipality. Only eight of the ten pilot municipalities provided the information requested.

Figure 25 – Resources Allocated to Counting by Control Municipalities (2011 election)[47]

Municipality	Eligible Voters (2011)	No. Staff on Counting at Municipality	Count Duration (mins)
Høyanger	3,257	5	979
Grue	4,111	5	788
Søgne	7,905	6	452
Tysfjord	1,653	8	417
Holmestrand	7,994	10	497
Vestvågøy	8,228	10	227
Haugesund	26,427	10	1,253
Kautokeino	2,388	12	222
Karmøy	30,072	12	422
Austevoll	3,528	15	1,222
Sande	6,461	15	620
Sortland	7,499	15	264
Luster	3,968	19	1,028
Løten	5,869	20	990
Sveio	3,798	20	1,030
Fræna	7,084	24	341
Rana	19,841	30	968
Vennesla	10,070	50	199
Molde	19,410	60	907
Total	**179,563**	**346**	**13,976**

As evident in the data above, the time taken to complete the counting and results process was almost exactly the same on average for pilot and control municipalities. Therefore, it is useful to analyze the number of staff per eligible voter that pilot and control municipalities used to achieve counting processes of similar duration, to see if the use of Internet voting might have impacted the resources that pilot municipalities used.

The total numbers of registered voters and staff used for pilot municipalities and control municipalities are shown in the charts above. Dividing the number of registered voters by the number of staff provides an average number of eligible voters who are administered by each staff member between the pilot and control municipalities. For the control municipalities there is one counting staff member for every 518 voters. For the pilot municipalities, there is one counting staff member for every 1,510 voters. This finding is somewhat surprising. Given the significant turnout of Internet voters in the pilot municipalities - over 25 percent of votes being cast by the Internet - it could have been expected that pilot municipalities would achieve similar counting times with less staff. However, the significantly fewer

[47] Information on the number of counting staff employed at the municipal level was provided by election administrators in the municipalities in a short series of questions sent to each pilot and control municipality. Only one of the control municipalities failed to provide the information requested.

numbers of counting staff employed by pilot municipalities at the municipal level cannot be solely explained by the use of Internet voting. It seems more plausible to conclude that other variables are the cause of this more efficient counting process (in terms of staff allocated to counting at the municipal level), variables that likely included the use of Internet voting.

It is worth noting that several control municipalities use some form of combined counting of ballots with other neighboring municipalities.[48] The combined counting makes it difficult in some cases to determine the number of staff employed in these counting operations, which are relevant for individual municipalities. This may skew the data slightly, making the average number of staff per registered voter for these three control examples higher than expected, although none of the three municipalities reported an especially large number of counting staff.

Are there special skill sets for staff that are required to administer the counting process when using scanning machines and are these skills difficult to find?

All of the pilot municipalities scanned ballots at the municipal level and the number of staff involved varied from six to 18, largely depending on the size of the municipality. In general the pilot municipalities did not find any significant problems in recruiting sufficient staff with the necessary qualifications, Radøy was the exception having indicated that skilled staff for ballot scanning was difficult to find.

In fact, four of the municipalities indicated that they used staff from within the municipal administration that had scanning experience from their everyday jobs - from the mail rooms, tax and finance departments - to scan ballots in the municipality. –. Additional training also played an important role in properly preparing for the ballot scanning process.

Control municipalities provided similar response to the questions posed. Two municipalities reported that they used staff with scanning experience from their finance department or IT department. Nearly all municipalities reported that it was easy to find sufficient qualified staff to count ballots, whether by hand or using ballot scanners. Only Kautokeino municipality indicated that they struggled to find counting staff at the municipal level. Many municipalities highlighted the importance of providing training before each election.

Overall, the staffing of municipality ballot counting operations was not seen as a particular challenge in the pilot or control municipalities.

Questions to the Ministry

A series of questions were also posed to the Ministry about current and future resources used to administer the counting and results processes related to Internet voting.

Firstly, the Ministry was asked about the resources that it employed to administer the Internet voting project in 2011 and whether any of the resources employed on the project were specifically allocated to

[48] Grue jointly scans its ballots in Kongsvinger municipality with six other municipalities. Holmestrand and Sande municipalities scan their ballots in Horten municipality.

the counting and results processes. Two staff members were employed full time to run the Internet voting project - mainly for the configuration and testing of the Internet voting system - and worked on all aspects of the Internet voting project, not just the counting and results process. One further person was employed specifically for the counting of Internet votes on election night.

The Ministry did not indicate that it had experienced any significant challenges in the administration of the Internet voting project. They also indicated that they would not make any noteworthy change to the way the project was administered if a similar project were conducted again.

Questions were posed about the scalability of the project and additional resources that might be required if Internet voting was to be extended to all voters in Norway. The Ministry believed that the project was easily scalable without a great deal of additional resources. Some more hardware would probably be required for an extension of Internet voting to all voters in Norway, but this would not pose a problem. An extra person to help manage the project at the Ministry would also be required, though no difficulty is anticipated in recruiting an additional staff member with the necessary skills. While not related to the counting and results component of the Internet voting system, the Ministry also indicated that an expansion of Internet voting would require a higher capacity in the help desk facility provided to Internet voters.

Audit Results

The Norwegian Internet voting system was designed so that end-to-end (E2E) verification of the functioning of the system was possible. The Ministry has hoped that stakeholders would make use of the E2E verification possibility and - independently of the Ministry - conduct an audit of the system to check that Internet votes had been stored as cast and counted as stored.[49]

When it became clear that no stakeholder intended to conduct an independent check of the functioning of the Internet voting system, the Ministry decided to contract an organization to conduct the audit exercise. The fact that the Ministry itself paid for the audit to take place could raise concerns about the independence of the contractor in auditing the work of the Ministry. However, the alternative, that no one audit the process, was even less desirable.

Computas AS was contracted to conduct the audit process. The different stages of audit that it conducted, as well as the results of each audit, are detailed below:

- **Verification of the certificate from the ID portal** – The independent auditor conducted a physical inspection of ID portal certificates obtained through the Ministry and through a second channel independent of the Ministry.

  Both certificates were found to be identical, demonstrating that ID portal certificate matched the certificate used in the cleansing process to verify that all ballots had a valid authentication token from the ID portal and were legitimate votes.

[49] The first stage of the verification of the Internet voting process, that votes were cast as intended, could only be conducted by voters (as the only ones knowing their voting intentions). This check was made possible through the provision of return codes to voters.

- **Comparison of hashes between the Vote Collection Server (VCS) and the Return Code Generator (RCG)** - Independent software was developed to verify that hashes of the encrypted votes stored on the VCS were the same as hashes of the encrypted votes stored on the RCG, and that no additional votes were stored on either server. This proves that votes of the same value are stored on each server.

  In fact, the comparison of the votes stored on the VCS and RCG found that there were 53 votes stored on the RCG, which were not present on the VCS. The Ministry had in fact indicated to Computas AS that between 54 and 57 votes would be found on the RCG with no corresponding encrypted vote on VCS. The Ministry indicated that these entries on the RCG were not problematic as they represented cases where an encrypted vote was not stored on the VCS due to some technical problem. The voters casting these ballots were informed that the vote had not been cast and a receipt was never sent out to the voter. All of the other votes stored on the VCS and RCG were identical.

- **Verification of the integrity of the ballot box after data transferred from the VCS to the Ministry's premises** – Independent software was developed to check that every ballot stored on the VCS was present and identical in the copy of the ballot box used for the counting process.

  The independent software showed that the contents of the VCS were identical to the contents of the ballot box used for the counting process.

- **Verification that the cleansing process has not injected new votes to the ballot box** – Independent software was developed to check that the result of the cleansing process did not contain any votes that were not registered on the VCS.

  All of the votes, which were passed from the cleansing process for counting, were represented in the ballot box from the VCS.

- **Verification of zero-knowledge proofs regarding the correct mixing and re-encryption of the encrypted votes** – The mixing process stage of the counting process creates a zero-knowledge proof to demonstrate that each mix-node has decrypted and encrypted groups of votes it has received as input correctly. Independent software was developed to check these zero-knowledge proofs, and in doing so verify that the mixing process output votes as the same value as were input into the mixing process.

  All of the zero-knowledge proofs were found to be correct, demonstrating that the mixing process produced a randomized but accurate copy of the ballots, which entered into the mixing process.

- **Verification of the zero-knowledge proofs regarding the correct decryption of the encrypted votes** – The decryption process for the votes, which are to be counted, produces a zero-knowledge proof for each vote that is decrypted. Independent software was developed to check the zero-knowledge proof for each decrypted vote.

All of the zero-knowledge proofs were found to be correct, demonstrating that the correct private key was used to decrypt the votes passed from the mixing process and, therefore, that the decrypted vote values accurately reflect the encrypted vote values.

Collectively, these audits demonstrate that the votes, which were received by the VCS have remained unaltered through the entire counting and results process. Not all of the votes received by the VCS have been counted, but this is expected due to the removal of some votes from the ballot box during the cleansing process.

In addition to the external audit of the voting and counting process, the log files generated by the various servers have also been subjected to an audit by both the Ministry and Scytl to check that the system operated correctly. Every transaction on the servers was logged, amounting to millions of log entries in total. Due to the volume of the log entries, the task of reviewing the logs is huge and the review process was still under way in the Ministry many months after the election.

While the review of the log files by the Ministry had not identified any significant problems with the Internet voting system by late March 2012, Scytl's audit of the log files did identify nine invalid votes included in the votes passed for counting, which is expanded upon in the next section.

6. Counting and Results Process Problems

A number of problems were encountered in the counting and results process during the 2011 local government election. This section of the report will discuss these problems, and outline their relevance to the Internet voting system itself.

Vote Cleansed for Late Submission

During the cleansing process one vote was listed in Figure 3 as being cleansed for "other reasons." The vote was cleansed because it was submitted after the expiry of the online voting session by the voter. When a voter logs on they are given 30 minutes to complete their voting transaction and if they exceed this time they are automatically logged out. The submission of a vote after the 30 minute period should not have been possible. However, it seems that this voter completed the voting transaction before the end of the 30 minute window but so close to the end of the 30 minutes, that when the system began to process the vote it was within the 30 minute window while the completion of the vote transaction on the server occurred after the 30 minutes, if only by a matter of milliseconds. The rules for the cleansing process are strictly applied and the vote was rejected for being submitted after the 30 minutes. The voter will have received a return code, however, and will have had no reason to believe that the vote was not submitted correctly.[50] While this situation was statistically highly unlikely to happen, it does demonstrate a (minor) flaw in the Internet voting system.

Invalid Internet Votes

After the completion of the cleansing, mixing and decryption processes for Internet votes on the evening of the elections, the decrypted votes were counted for their relevant elections. Subsequently the Ministry reviewed the logs from this process and discovered that of the 53,916 votes that passed through these stages to be counted, nine votes could not be interpreted after decryption. In fact, these Internet votes had more ballot selections than permitted under the election rules, and were therefore not included in the count of Internet votes.

The votes were distributed amongst the various local government elections in the following manner:

[50] For the explanation provided during the decryption ceremony and subsequent questions see the record of the ceremony at http://media01.smartcom.no/Microsite/dss_01.aspx?eventid=6316, at 53 minutes to 1 hour and 1 minute.

Figure 26 – Distribution of Invalid Internet Votes[51]

Election	Number of Invalid Votes
Rogaland County	1
Sogn og Fjordane County	1
Møre og Romsdal County	2
Nordland County	1
Sandnes Municipality	1
Bodø	2
Hammerfest	1
Total	**9**

The Ministry confirmed that the invalid votes could not have impacted the results of their respective elections as the margin between the last candidate elected and the first candidate not elected is larger than the number of unreadable votes in every election affected. However, the generation of invalid Internet votes should not be possible and is indicative of some flaw in the Internet voting process.

Scytl, the supplier of the core Internet voting system, was asked to investigate how these invalid votes could have been generated. The Scytl report[52] considered several possible sources for the generation of invalid Internet votes, including:

- A configuration error when specifying or assigning the voting areas to the voters
- An attack by the same voter that cast the vote by forging a vote containing more than one selection for the same candidate or party
- An error in the applet that included the same party or candidate twice in the encrypted vote[53]

After exhaustive analysis, the possibility of a configuration error was discarded by Scytl, "[t]herefore, the final conclusion is that the votes were generated by including more than one selection for the same candidate due an attack or an applet error when casting the vote."[54] When considering these two possibilities Scytl concluded that:

> *Unfortunately, both cases generate the same type of invalid vote and it is not possible to distinguish which one has generated it. Furthermore, both cases occur in the voting side and therefore, are impossible to detect*.[55]

It was noted that these invalid votes had been detected during the counting process and, therefore, not included in the count. However, the voter would have believed that a valid vote had been submitted at the time of voting, as these invalid votes were accepted by the return code generator and would have led to a return code being sent to the voter. Furthermore, Scytl identified a number of improvements

[51] Data provided by the Ministry in email of October 21, 2011.
[52] Ergo Group/Scytl (2011) "Audit Report of the 2011 Municipal and County Council Election Results", version 0.1, October 17, 2011, provided by the Ministry in an email dated October 24, 2011.
[53] *Ibid*, p.5.
[54] *Ibid*, p.5.
[55] *Ibid*, p.10.

that would be made to mitigate this problem in the future and to report it to the voter when they submit the vote.[56]

Manual Entry of Preliminary Results for Advance Votes

All of the Internet voting pilot municipalities also trialed the use of a new election management system. The system includes functionality to automatically upload results data from the election management system into the Election Night Base/Statistics Norway,[57] instead of the manual process of logging in and entering results data that other municipalities use.

When the pilot municipalities came to use this functionality to upload preliminary results on election night, they were not able to incorporate the advance Internet vote data held by the Ministry centrally. Ergo Group, the supplier of the new election management system, worked to try and resolve the problem. However, at 11pm on election night, the Ministry instructed the pilot municipalities to use the results for the electronic votes on the Ministry's website and manually add the preliminary results for the electronic votes to the preliminary results for the advance paper votes. As a result, most of the Internet pilot municipalities reported preliminary results for advance votes to Statistics Norway by logging onto Statistics Norway manually, and not through the new administration system.

The problem was subsequently fixed by Ergo Group, and all Internet voting pilot municipalities were able to report in final results using the new election management system. While the problem delayed the reporting of preliminary results from the pilot municipalities, it did not delay the reporting of final results. It is also worth noting that this issue was not a problem in the Internet voting system itself, but with the new election management system, which is entirely separate.

Finnmark/Hammerfest

Final results issued for the Finnmark County election were found to have not included the Internet votes cast in Hammerfest municipality, due to a human error in the Finnmark County administration.[58] However, control procedures in the county picked up this omission and the final results were changed to include these votes on October 4, 2011. This resulted in a change in the distribution of seats between the Labor party and the Sami People's Party. Again, while this mistake related to Internet votes, it was not caused by the Internet voting system.

Scanning of Ballots in Ålesund Municipality

In Ålesund municipality, ballots are counted at the municipal level using ballot scanning machines. Several weeks after the election, an observer noted very low levels of corrections to the ballots (personal votes cast for individual candidates on the lists) from one of the constituencies in Ålesund, Spjelkavik. The observer contacted the election staff in the municipality. Upon examining the observation it was found that the scanning process in the municipality had not functioned correctly for one polling station in the municipality and approximately half of the ballot corrections had not been

[56] *Ibid*, p.5.
[57] The Government Agency responsible for election statistics reporting, as well as other national statistics.
[58] Email from the Ministry, dated October 21, 2011.

recorded. The Ministry indicated that it was likely due to poor quality ballot papers causing difficulties in the scanning process.[59]

The affected ballots were recounted in the middle of October and new results issued. The new results did not have any effect in the distribution of mandates between party lists in Ålesund, but it did change the candidates that were elected for one of the political parties, The Christian Democratic Party. While the error occurred in a pilot municipality, the error had nothing to do with Ålesund's participation in the Internet trial. The error was connected to the quality of ballot papers and the scanning process.

[59] Emails from the Ministry, dated 21 October 2011 and 21 January 2012.

7. Summary of Key Findings

This chapter summarizes key findings from the research. The key findings are presented here in terms of the four indicators of success defined by the IFES team for assessing this component of the Internet vote project: speed, efficiency, quality and trust in the counting and results process.

Speed of the Counting and Results Process

The data concerning the declaration time of results in the pilot municipalities shows that the pilot municipalities declared their final results approximately three hours faster during the 2011 local government elections compared to the 2007 local government elections. However, similar reductions in the time taken to declare results were also seen in the control municipalities, although the reductions were slightly less for the control municipalities. Pilot municipalities experienced an average 2 hour 58 minute reduction in the time taken to declare results, compared to a 2 hour 49 minute reduction for control municipalities.

Given the number of pilot municipalities and the small difference in the reduction in declaration time, it is unlikely that this data is an indication of any overall impact on the counting process resulting from the use of Internet voting. On the basis of the declaration time data it does not seem that the use of Internet voting made any significant difference to the time it takes to complete the counting and results process.

Initial analysis of the election data seemed to indicate a relationship between the percentage of Internet voting usage and the time taken to declare results in the pilot municipalities, with municipalities with higher levels of Internet voters taking less time to declare final results. However, regression analysis showed that the time taken to declare results in 2007 was a much stronger influence on the time taken to declare results in 2011, indicating that other factors were likely more important determinants of the time taken to declare results.

Overall the data concerning the impact of Internet voting on the speed of the counting process does not make a clear case for what, if any, the impact might be. The overall time taken to declare results is very similar for pilot and control municipalities, with both sets of municipalities experiencing very similar reductions in the time taken to declare results between the 2007 and 2011 elections.

It may have been expected that the data would show a clear relationship between the use of Internet voting and declaration times, with pilot municipalities reducing their declaration times compared to control municipalities. The data does not seem to show this, which may be due to the small number of municipalities that participated in the pilot, making larger scale inferences difficult and the data set more susceptible to peculiarities of the pilot municipalities. The failure to prove any impact on the speed of the counting and results process for pilot municipalities may also be the result of competing factors influencing the speed of the counting process in different ways.

Pilot municipalities saw a greater percentage of votes cast during the advance period of voting than non-pilot municipalities. All municipalities saw an increase in the number of votes cast in the advance period,

rising from 16.7 percent in 2007 to 22.2 percent in 2011. Pilot municipalities saw a much larger increase in advance voting, with a rise in advance voting in excess of 15 percent.[60] The increase in the number of votes cast in advance results in less paper ballots being cast in polling stations and having to be counted at the polling station. The counting of advance paper votes can be started before the close of polling. Advance votes cast over the Internet are tallied automatically and once they have been cleansed, mixed and decrypted, can quickly produce results. Therefore, the increase in advance votes, and especially the use of Internet voting, will have worked to speed up both polling station and municipality counting processes.

In opposition to this is the process of counting the Internet votes. All of the voters casting advance votes need to be marked on the electronic electoral roll before the cleansing, mixing and decrypting process for Internet votes can take place. As a result, the Internet vote counting process starts only after other municipalities are in a position to announce their results. This additional component of the counting process for Internet voting municipalities prolongs the counting and results process.

In addition, the pilot municipalities had to adapt to using the new election administration system, which they had not used before the 2011 elections. Likewise, they were using an electronic electoral roll for the first time. The Ministry also implemented new designs for the ballots in the pilot municipalities, which were not used in the control municipalities. These new ballot papers were larger than the ones used in previous elections and complicated the scanning process in some of the pilot municipalities. These are all factors, which may have caused the counting and results process in the pilot municipalities to take longer that in the control municipalities. The fact that the pilot municipalities did not take longer to count the ballots could have been due to the use of Internet voting.

It may be that in the future, as municipalities adapt to these new aspects of running elections, the impact of Internet voting on the time taken to complete the counting and results process would become evident. It is also possible in the future that wider use of Internet voting might offset the increase in counting time resulting from the additional stage in the counting process.

The possibility does exist for Norway to make the counting and results process faster while using Internet voting if, as in Estonia, there was no possibility for Internet voters to cast a ballot on Election Day. The counting of Internet votes would then only have to wait for the last advance votes to be processed by municipalities, and not for the return and processing of all electoral registers from polling stations. However, it is clear that the possibility for Internet voters to cast a ballot on Election Day plays a significant role in protecting the secrecy and freedom of the vote while providing Internet voting as an option.

Efficiency of the Counting and Results Process

All of the pilot and control municipalities were contacted to find out how many resources they allocated to the counting and results process at the municipal level.

[60] Source - http://www.ssb.no/kommvalg_en/ [last accessed on March 27, 2012].

As indicated above, on average the time taken for the counting and results process was very similar for pilot and control municipalities. The amount of resources needed to deliver results in similar timeframes were very different, and obviously largely dependent on the size of the municipality, e.g., how many votes were required to be counted before results could be announced. The average number of counting staff required to count the votes (in a similar time on average) in the pilot municipalities was significantly less than for control municipalities. In pilot municipalities, there was only one municipality counting staff member for every 1,530 voters; in control municipalities approximately three times as many staff was required with one staff member for every 472 registered voters. This represents a 69 percent reduction in the numbers of staff required per voter to count votes at the municipal level.

With over 25 percent of voters in the pilot municipalities casting Internet ballots, it would have been anticipated that the counting of paper ballots at the polling station and municipal level should be completed faster than in non-pilot municipalities. However, the level of Internet voting alone cannot account for the vast difference in number of polling staff used to complete the counting and results process in approximately the same time. Other variables not obvious from this analysis must also have a strong influence on the scale of resources used by pilot and control municipalities to count ballots at the municipal level.

It appears that municipalities generally do not struggle to obtain the resources necessary to conduct the count and results process at the municipal level, often using qualified staff from other parts of the municipal administration. The Ministry also did not believe that the small number of staff resources it used for the central administration of the Internet voting project would be difficult to obtain in the future, even with the small additional staffing requirements necessary with an expansion of Internet voting to all voters.

Another aspect of the Internet vote counting process that needs consideration is the process of updating the electronic electoral registers with advance votes cast. This is required so that Internet votes can be cleansed of voters who have also voted by paper ballot. In all of the pilot municipalities, electronic electoral registers were used to facilitate this process. None of the pilot municipalities indicated that there had been any problems in the use of these registers. Some municipalities did indicate that they had been frustrated by the delays in the release of Internet vote results from the Ministry once the update of the electoral registers had been completed.

It is somewhat difficult to predict with any degree of accuracy what kind of efficiency improvements could be expected were Internet voting to be extended to all voters as it is impossible to know what the usage of Internet voting compared to paper balloting would be. The baseline of Internet voting usage from the pilots, a little over 25 percent, seems to indicate that Internet voting could be very popular in Norway in the future as other countries have seen Internet voting usage rise over time.

Even if Internet voting was offered to all voters and only used at similar levels seen in the pilots, there is potential for significant savings in the cost of counting votes. If 25 percent of ballots were cast over the Internet, this might represent somewhere in the region of a 15-20 percent reduction in the numbers of

people casting votes in polling stations.[61] This would reduce the workload of polling station staff by 15-20 percent in terms of voters who need to be processed and ballots, which need to be counted at the close of polling. Such a change could presumably facilitate a similar reduction in the numbers of polling staff, although the decision would be up to the MECs. Likewise, if 25 percent of the votes were cast over the Internet, the staff required to count and recount votes at the municipal and county levels could be reduced, maybe by 25 percent, as Internet votes would not be counted at municipal and county level. The resources required to conduct counting at the central level are minimal in comparison.

However, the anticipation of any such efficiency savings needs to be tempered by the uncertainty that exists surrounding the exact use of Internet voting until the close of polling stations. Municipalities do not know how many paper ballots will actually need to be counted on Election Day. Although the number of voters casting Internet ballots is known before Election Day, any or all of them could attend a polling station to cast a paper ballot on Election Day. Only after several elections using Internet voting would election staff be able to predict this with any degree of certainty. Until the use of Internet voting has stabilized across several elections, election staff at the municipal and county level will likely have to plan for the worst case scenario of significant numbers of Internet votes possibly being cancelled on Election Day. Therefore efficiency gains in terms of reducing the number of staff required to conduct the count may not be realized until Internet voting has been used over several elections.

Quality of the Counting and Results Process

Electoral systems, whether paper-based or electronic, should be designed such that invalid ballots are minimized, as an invalid ballot represents either a failure of the voter to properly record their voting intention or a failure of the system to properly authorize an otherwise legitimate ballot submitted by the voter. The quality of the system can be partially assessed by the extent to which invalid ballots occur. However, invalid ballots should not be confused with blank ballots, which often are legitimate expressions of voter dissatisfaction with the electoral choices being offered.

Internet voting systems should be designed so that voters cannot submit invalid ballot choices and the system does not invalidate ballots in other ways. There should be no invalid ballots with Internet voting and any invalid ballots generated by the existing system would represent an improvement in the quality of the counting process provided by Internet voting.

The 2011 elections saw 70 invalid paper ballots in the pilot municipalities for the municipal elections, representing 0.07 percent of the number of total votes cast, and 43 in the county elections, representing 0.04 percent of the total votes cast. This compared favorably with the percentage of invalid ballot cast nationally, which was 3,277 (0.13 percent) for municipal elections and 2,312 (0.10 percent) for county elections. The reduction rate of invalid ballots in pilot municipalities may have been anticipated, although the lower level of invalid ballots in the pilot municipalities is far greater than expected and may possibly be explained by the 26-27 percent usage of Internet voting. However, further analysis of the data fails to prove that the lower rates of invalid ballots are a result of Internet voting. Rather, the rates of invalid ballots in 2007 are a much stronger indicator of 2011 invalid ballot rates.

[61] Recognizing that some Internet voters might have cast advance paper ballots if Internet voting would not have been offered.

This finding is counter-intuitive in some ways, but could be explained by two factors. Firstly, the finding could be explained by the small size of the pilot municipality data set, with a larger data set expected to more clearly demonstrate a positive relationship between Internet voting and lower invalid ballot rates. Alternatively, it may be that the kinds of voters who have chosen to vote over the Internet are ones who are highly unlikely to have cast invalid ballots.

The number of complaints received about the counting and results process in pilot and control municipalities was also monitored. However, as no complaints were received about the counting and results process in pilot or control municipalities, no conclusions can be drawn about the quality of the process.

A further aspect of the quality of the counting and results process relates to the mechanisms that have been put in place to ensure that multiple voting cannot take place, especially with the possibility for voting over the Internet multiple times and casting a paper ballot even when an Internet vote has been cast. The mechanisms implemented by the Ministry to ensure such multiple voting does not take place build upon the existing mechanisms for ensuring this with paper ballots cast during the advance period and on Election Day. These mechanisms are supplemented by the use of an electronic electoral register, which allows entries on the electoral register to be updated instantly.

From a system design perspective, the system is logically capable of ensuring that only one vote from each voter is included in the count. It is assumed that the testing regime that the Internet voting system was subjected to has ensured that these rules for exclusion of repeat Internet ballots, and the supremacy of paper ballots, have been accurately implemented. This being the case, the use of Internet voting does not entail any reduction in the quality of the election as a result of Internet voting because of the possibility for one voter to cast and have counted multiple ballots.

The Norwegian Internet voting system employs E2E verification mechanisms, which can also be independently checked to ensure that system functions correctly. These mechanisms can be used to check that all valid votes - and only valid votes - are included in the count and that these votes are not amended in any way at the different stages of the counting and results process.

As no independent organization attempted to conduct an audit of the functioning of the system, the Ministry contracted Computas AS to conduct the audit. Computas AS checked each stage of the counting and results process and found that the integrity of the cast votes was maintained, confirming that the results generated for Internet ballots accurately reflected the ballots received by the ballot box.

Trust in the Counting and Results Process

When considering the issue of trust in Norway, it is important to recognize the exceptionally high levels of trust that exist in Norwegian government institutions. The OECD's Better Life Index finds higher than average (for OECD countries) levels of voter turnout and trust in political institutions in Norway, which they use to argue that Norway enjoys high levels of trust in government and public administration.[62] In the Norwegian context, Christensen and Laegreid note that there is a strong relationship between trust

[62] See http://oecdbetterlifeindex.org/countries/norway/ [last accessed on February 1, 2012].

in different government institutions such that, "People with a high level of trust in one institution also tend to trust the other institutions, while distrust in one is related to distrust in others."[63] A high general level of trust in public administration will, therefore, likely lead to a high level of trust in the Ministry's implementation of Internet voting.

The 2011 local government elections saw ten municipalities piloting Internet voting and, in those municipalities, 26.4 percent of municipal ballots and 27.24 percent of county ballots were cast over the Internet. This was exceptional for a first experiment with Internet voting. Other countries, which have implemented Internet voting, have seen much lower initial turnouts, with voters increasingly using Internet voting as they become more comfortable with it.[64] The significant usage of Internet voting in itself is indicative of considerable trust in the system.

The results of the local democracy survey support this conclusion. A question on the survey asked about the levels of trust placed in the counting of Internet ballots, as well as for the counting of paper ballots using scanning machines and the hand counting of paper ballots. Of those questioned, 85 percent indicated a great deal of trust or some trust in the counting of Internet ballots. Comparatively, 92 percent of respondents had similar levels of trust in the hand counting of paper ballots and 94 percent in the scanning of paper ballots. While the levels of trust placed in the counting of Internet ballots is lower than other existing methods of counting ballots, it is still very high. Furthermore, it could be expected that with the repeated use of the Internet for voting, this level of trust would increase (as long as no problems occurred).

Focus groups were held with political party representatives from the pilot municipalities and national electoral stakeholders. The electoral stakeholders represented political parties and civil society organizations involved in observing previous Norwegian elections. Focus groups assessed their opinions about the use of Internet voting. The trust these stakeholders had in Internet vote counting, in comparison to existing methods of counting ballots, took up a significant part of discussions with electoral stakeholders.

These focus groups exhibited a significant divide between the national and pilot municipality stakeholders in their attitudes towards Internet voting in general, and the counting of Internet votes. All representatives at the focus groups had a high degree of confidence in the administration of elections in Norway in general. Political party representatives from the pilot municipality seemed more appreciative of the flaws in the current systems of counting ballots (hand counting and ballot scanning), recognizing that human errors happen and ballot scanning also has its own challenges. They also seemed to be more informed about the operation of the Internet voting system. National representatives, in contrast, stressed the benefit of the multiple mechanisms used to count paper ballots, normally a mixture of hand counting and ballot scanning, which serve to verify that the count is accurate.

[63] Christensen, T. and Laegreid, P. (2003) Trust in Government – the Significance of Attitudes Towards Democracy, the Public Sector and Public Sector Reforms, p. 23 at http://www.ub.uib.no/elpub/rokkan/N/N07-03.pdf [last accessed on February 1, 2012].

[64] Estonia is a good example of this (% of participating voters who used Internet in each election): 2005 local elections (1.9%), 2007 Parliamentary elections (5.5%), 2009 European Parliament elections (14.7%), 2009 local elections (15.8%), 2011 Parliamentary elections (24.3%)

The pilot municipality representatives were generally very positive about the use of Internet voting, trusting it and wanting to see it continued in the future. In contrast the national stakeholders were unanimously against the future use of Internet voting. The apparent divide in opinion does need to be treated with some caution. Pilot municipalities were self-selecting to some extent, as they had to apply to the Ministry to be part of the Internet voting pilot with the Ministry selecting from those municipalities applying. As such the pilot municipalities, and the politicians from those municipalities, were likely to be predisposed to Internet voting and may have invested political capital in the pilots being viewed as successful.

However, if the pilots were manifestly problematic it would be unlikely that support by local stakeholders would remain. It is also possible that local stakeholders have a far deeper understanding of the challenges of actually implementing elections, and better recognized the actual and potential benefits of using Internet voting. It is clear that if Internet voting is to be used again the Ministry will need to work hard to gain and maintain the trust of these national stakeholders.

Importantly, all of the participants in the focus groups thought that if Internet voting is to be continued, it should become a country-wide channel for voting within the country at all levels of elections. All of the participants saw Internet voting as a supplemental and optional way of voting in the future and not as a replacement for paper balloting.

In-depth interviews with election administrators from all of the pilot municipalities were also scheduled, and again, the confidence in the counting of Internet votes vis-a-vis the counting of paper ballots was discussed. These election administrators were well aware of the flaws that exist with the counting of paper ballots, sometimes with large differences in count results being found between separate scans of the ballots and the possibility for human errors in the counting of paper ballots.

The introduction of Internet voting was generally viewed positively by these election administrators, with most indicating that they received positive feedback from voters in their municipalities. The existence of a return code for Internet voters was also mentioned as a mechanism for generating trust and confidence in the system.

Generally, the election administrators surveyed saw the counting of Internet votes as the more trusted method for counting votes, followed by ballot scanning and hand counting. Hand counting was placed last because of the possibility of human error in the counting process. These administrators also noted the delays in the completion of the Internet vote counting and results process, which need to be addressed in the future if they were not to adversely affect stakeholder impressions of the Internet voting system.

No complaints were received about the Internet voting system or about the counting and results process for Internet votes. Similarly, no complaints were received about the counting of paper ballots in pilot or control municipalities. The number of complaints received can be seen as an indication of the trust that voters and other stakeholders have in an electoral system as a whole. It is clear that the Norwegian population has a high degree of trust in the administration of elections, and in public administration in general. Importantly, the lack of any complaints concerning the Internet voting system

or the counting of Internet votes is an indication that the counting of Internet votes has not undermined the trust that Norwegian citizens have in the electoral process.

Conclusion

IFES identified four indicators of success for the counting and results component of the Norwegian Internet voting system – speed, accuracy, quality and trust.

It was anticipated that the use of Internet voting would reduce the time taken to declare results in the pilot municipalities. While reductions in the time taken to declare results were seen, similar reductions in the time taken to declare results were also seen in the control municipalities. Despite detailed analysis of the effect of Internet voting on the time taken to declare results, no impact could be identified based on the data collected from the ten pilot municipalities.

There are possible explanations why the anticipated reductions in declaration times for the pilot municipalities did not occur, and some of these explanations may be less influential with any future use of Internet voting in Norway (such as familiarity with the new election management system and the electronic electoral roll, and adaption to the new ballot format). While no impact on the speed of counting and results could be identified on the basis of the September 2011 pilots, faster counting and results is possible in the future using Internet voting.

The use of Internet voting also holds out the possibility for significant efficiency savings related to the counting process. On the basis of data provided by municipalities, there were three times as many staff allocated to counting ballots in control municipalities than in the pilot municipalities. While it may seem like a clear indication that the use of Internet voting resulted in significant reductions in the resources used to count ballots in the pilot municipalities, further analysis brings this conclusion into question.

Regression analysis of the numbers of staff allocated to counting ballots indicates that a far stronger determinant of the number of staff used to count votes in the pilot and control municipalities is the number of staff allocated to count in the 2007 local government elections. Using regression analysis, it was not possible to identify any impact for Internet voting on the number of staff allocated to the counting process in municipalities. Regression analysis on such a small data set is not without its problems, but the conclusions of the regression analysis cast some doubt on the initial findings. As a result, the efficiency benefits anticipated from using Internet voting are not proven, and also not disproven, by the Internet voting pilots.

Pilot municipalities experienced much lower rates of invalid ballots than were experienced nationally, which is a clear indicator of the quality of the counting and results process. In fact, pilot municipalities' invalid ballot rates were 50-60% lower than national invalid ballot rates. At first glance it would be tempting to accredit the reduction in invalid ballots, at least in part, to the use of Internet voting. However, regression analysis again indicates that the levels of 2007 invalid ballot rates (when there was no Internet voting) are much stronger indicators of 2011 invalid ballot rates, and that no effect in invalid ballots rates of Internet voting can be identified. The value of regression analysis on such a small data

set can be questioned, but the initial conclusion that Internet voting led to lower rates of invalid ballots should be treated with caution.

The accurate counting of votes is a significant challenge with paper balloting in the Norwegian electoral system, especially with properly recording the casting of personal votes within party lists. Mistakes can occur in the counting process, both with the hand counting or scanning of ballots. The counting of Internet votes should remove the possibility of these counting errors. The Norwegian Internet voting system has implemented E2E verifiability, so the accuracy of the counting of Internet ballots can be determined. The independent auditor showed that the results generated for Internet votes accurately reflected the ballots received by the VCS. This is an improvement in terms of quality over the paper ballot counting process, although it was beyond the scope of this assessment to determine the level of inaccuracy that exists with paper ballot counting.

All indications are that Norwegian voters placed a high degree of trust in the Internet voting system. Exceptionally high levels of Internet voting usage were seen for a first time use of Internet voting, which must be seen as indicative of trust in the system. The lack of complaints about the system is also a good indication of trust. Focus groups, interviews with election administrators from the pilot municipalities, and survey results from the Local Democracy Survey, all reinforced the finding that the Internet voting system was trusted to deliver accurate electoral results.

In many ways, the high levels of trust in the Norwegian Internet voting system is to be expected, given the generally high level of trust in government in Norway. It is still important, however, that the use of Internet voting does not undermine this level of trust. All of the evidence collected suggests that Internet voting has not undermined existing trust in the electoral process or wider government institutions.

Overall, the Internet voting pilots did not demonstrate a definitive improvement in the speed and efficiency of the counting and results process, although the failure to see such improvement may be due to peculiarities with the small sample size of pilot municipalities and other factors, which counter the impact of Internet voting. Improvements were identified in the quality of the election using Internet voting, and importantly, the use of Internet voting did not seem to undermine the high levels of trust in the conduct of elections and public administration.

Annexes

Annex 1 – List of Control Municipalities

Hedmark County (Tynset)

Municipality	Eligible votes	Counting of ballots
Grue	4111	Scanner
Løten	5869	Manual (Scanning in Hamar Municipality)

Vestfold County (Re)

Municipality	Eligible votes	Counting of ballots
Holmestrand	7994	Scanner
Sande	6461	Manual (Scanning in Horten Municipality)

Vest-Agder County (Mandal)

Municipality	Eligible votes	Counting of ballots
Søgne	7905	Scanner
Vennesla	10070	Manual

Rogaland County (Sandnes)

Municipality	Eligible votes	Counting of ballots
Karmøy	30072	Scanner
Haugesund	26427	Scanner

Hordaland County (Radøy)

Municipality	Eligible votes	Counting of ballots
Austevoll	3528	Manual
Sveio	3798	Scanner

Sogn og Fjordane County(Bremanger)

Municipality	Eligible votes	Counting of ballots
Høyanger	3257	Scanner
Luster (16)	3720	Manual

Møre og Romsdal County (Ålesund)

Municipality	Eligible votes	Counting of ballots
Fræna	7084	Manual
Molde	19410	Scanner (Manual for the county election)

Nordland County

Bodø

Municipality	Eligible votes	Counting of ballots
Rana	19841	Scanner
Tysfjord (16)	1648	Manual

Vefsn

Municipality	Eligible votes	Counting of ballots
Vestvågøy	8228	Scanner
Sortland	7499	Manual

Finmark County (Hammerfest)

Municipality	Eligible votes	Counting of ballots
Sør-Varanger	7445	Scanner
Kautokeino (16)	2289	Manual

Annex 2 – Internet Voting Statistics Provided by Ministry

Data contained in email of November 28, 2011

A. Election turnout in the Norwegian Municipal and County Council Election 2011 in municipalities participating in the Internet voting trials.

Municipality	Eligible Voters 2011 [1)]	Number of voters (crossed off the electoral roll) 2011	Advance voters 2011	Election Day voters 2011	Election turnout 2011 [2)]	Election turnout 2007 [2)]	Election Turnout 2003 [2)]	Change in turnout - 2003 to 2007	Change in turnout - 2007 to 2011
Bodø	36,635	24,131	9,990	14,141	65.9 %	59.5 %	47.5 %	12.0 %	6.4 %
Bremanger	2,955	1,947	601	1,346	65.9 %	65.1 %	63.8 %	1.3 %	0.8 %
Hammerfest	7,752	4,373	1,812	2,561	56.4 %	51.7 %	51.0 %	0.7 %	4.7 %
Mandal	11,764	7,413	2,254	5,159	63.0 %	61.4 %	62.8 %	-1.4 %	1.6 %
Radøy	3,687	2,475	954	1,521	67.1 %	69.7 %	65.9 %	3.8 %	-2.6 %
Re	6,870	4,395	1,300	3,095	64.0 %	63.0 %	62.5 %	0.5 %	1.0 %
Sandnes	48,689	30,537	10,349	20,188	62.7 %	61.5 %	57.5 %	4.0 %	1.2 %
Tynset	4,163	2,870	1,144	1,726	68.9 %	65.0 %	60.1 %	4.9 %	3.9 %
Vefsn	10,456	6,193	2,078	4,115	59.2 %	57.8 %	55.8 %	2.0 %	1.4 %
Ålesund	34,535	20,716	7,790	12,926	60.0 %	57.6 %	52.5 %	5.1 %	2.4 %
Sum	**167,506**	**105,050**	**38,272**	**66,778**					

[1)] Includes the 16- and 17- years olds in Bodø, Hammerfest, Mandal og Ålesund, but these voters were only entitled to vote in the Municipal Council Election

[2)] Calculated on numbers of voters crossed off in the electoral roll, common for both the municipal council election and county council election.

B. Voters who voted in the advance voting period (on paper or by Internet) in the Norwegian Municipal Council and County Council Election 2011 in municipalities participating in the e-voting trials.

Municipality	Eligible Voters	No. of advance paper voters	No. of advance Internet voters *	Total of advance voters	% eligible voters voting in advance on paper	% eligible voters voting in advance on Internet**	% eligible voters voting in advance	% actual voters voting in advance on paper	% actual voters voting in advance on Internet**	% actual voters who voted in advance	% advance voters that voted on Internet **
Bodø	36,635	2,976	7,014	9,990	8.12%	19.15%	27.27%	12.33%	29.07%	41.40%	70.21%
Bremanger	2,955	193	408	601	6.53%	13.81%	20.34%	9.91%	20.96%	30.87%	67.89%
Hammerfest	7,752	680	1,132	1,812	8.77%	14.60%	23.37%	15.55%	25.89%	41.44%	62.47%
Mandal	11,764	788	1,466	2,254	6.70%	12.46%	19.16%	10.63%	19.78%	30.41%	65.04%
Radøy	3,687	183	771	954	4.96%	20.91%	25.87%	7.39%	31.15%	38.55%	80.82%
Re	6,870	313	987	1,300	4.56%	14.37%	18.92%	7.12%	22.46%	29.58%	75.92%
Sandnes	48,689	2,103	8,246	10,349	4.32%	16.94%	21.26%	6.89%	27.00%	33.89%	79.68%
Tynset	4,163	237	907	1,144	5.69%	21.79%	27.48%	8.26%	31.60%	39.86%	79.28%
Vefsn	10,456	744	1,334	2,078	7.12%	12.76%	19.87%	12.01%	21.54%	33.55%	64.20%
Ålesund	34,535	2,317	5,473	7,790	6.71%	15.85%	22.56%	11.18%	26.42%	37.60%	70.26%
SUM	**167,506**	**10,534**	**27,738**	**38,272**	**6.29%**	**16.56%**	**22.85%**	**10.03%**	**26.40%**	**36.43%**	**72.48%**

*Calculated on numbers of voters crossed off in the electoral roll, common for both the municipal council election and county council election.

** Note that this is calculated on figures after the cleansing process (i.e. the process to make sure voters get only one approved Internet vote and whether the voters have voted on paper). If a voter voted on paper, either in the advance voting period or on Election Day, this paper vote would overwrite the Internet vote. These voters are not included here.

C. Electronic votes - Municipality Election

Municipality	Total number of casted e-votes*	Number of cleansed e-votes	E-votes after cleansing **
Bodø	7,226	269	6,957
Bremanger	445	38	407
Hammerfest	1,190	64	1,126
Mandal	1,523	66	1,457
Radøy	810	42	768
Re	1,042	61	981
Sandnes	8,518	325	8,193
Tynset	959	56	903
Vefsn	1,386	58	1,328
Ålesund	5,679	245	5,434
Sum	28,778	1,224	27,554

* Before cleansing

**Blank votes included

D. Electronic votes - County Election

Municipality	Total number of casted e-votes*	Number of cleansed e-votes	E-votes after cleansing **
Bodø	6,953	258	6,695
Bremanger	406	30	376
Hammerfest	1,032	39	993
Mandal	1,374	56	1,318
Radøy	742	32	710
Re	933	36	897
Sandnes	8,279	344	7,935
Tynset	790	34	756
Vefsn	1,268	50	1,218
Ålesund	5,220	191	5,029
Sum	26,997	1,070	25,927

* Before cleansing

**Blank votes included

E. Total number of casted e-votes, cleansed votes and e-votes after cleansing

Total number of e-votes cast, both elections*	**55,775**
Total number of cleansed votes both elections*	**2,294**
Total number of e-votes after cleansing, both elections*	**53,481**

* Doesn't include the 9 unreadable votes

Data contained in email of email October 20, 2011

A. Cleansing of Internet Votes – Municipal and County Council Elections

Municipality	A. Total Number of Cleansed Votes	A1.Cleansed Municipal votes	A2.Cleansed County votes	B. Votes Cleansed Due to Another Internet Vote Cast	C. Number Voters With Cleansed Votes Due to Another Internet Vote Being Cast	D. Number of Votes Cleansed Due to Casting a Paper Vote	E. Number of Votes Cleansed Due to Casting Advance Paper Vote	F. Number Votes Cleansed Due to Casting a Vote Election Day	G. Number of Votes Cleansed Due to Removal from Electoral Roll	H. Number Votes Cleansed for Other Reasons
Tynset	90	56	34	X	X	134 **	X	X	X	X
Bremanger	68	38	30	X	X		X	X	X	X
Radøy	74	42	32	X	X		X	X	X	X
Re	97	61	36	X	X		X	X	X	X
Ålesund	436	245	191	X	X	86	X	X	X	X
Sandnes	669	325	344	X	X	162	X	X	X	X
Hammerfest	103	64	39	X	X	67	X	X	X	X
Mandal	122	66	56	X	X	63	X	X	X	X
Vefsn	108	58	50	X	X	141 **	X	X	X	X
Bodø	527	269	258	X	X		X	X	X	X
Total	2294 (B+D+G+H)	1224	1070	1632*	1020	653 (E+F)	118***	535***	8	1

*The highest number of Internet votes cast by the same individual was 5 votes.

**When it comes to the votes cleansed due to casting a paper vote and the distribution of these on the municipalities some detailed information was not extracted in the cleansing process. The cleansing process was run at the same time for Tynset, Bremanger, Radøy og Re, and in this operation we did not extract the individual numbers for each of the municipalities regarding cleansed votes due to casting a paper vote. We therefore only know that the total number for these 4 municipalities is 134. Vefsn and Bodø are reported together for the same reason.

*** There is a small margin of error to these numbers. On Saturday 10 September a cleansing process was conducted that included all advance paper votes that had been approved at that time. E is based on this number. F is based on D minus E. There will however be a small number of the advance paper votes that were received and approved by the electoral committee on Election Day. Some of these late approved advance paper votes may have overwritten Internet votes, but this will be a very small number.

Annex 3 – Source Data for Statistical Analysis

Source Data - Figure 11 - Number of Registered Voters vs Minutes Taken to Complete the Results (2007 election, pilot and control municipalities)

Municipality	No. Voters (2007)	Count Duration 2007 (hh:mm)	Count Duration 2007 (mins)
Pilot Municipalities			
Alesund	31,655	62:18	3738
Bodø	34,731	02:09	129
Bremanger	3,006	13:33	813
Hammerfest	7,108	05:47	347
Mandal	10,837	18:11	1091
Radøy	3,518	05:23	323
Re	6,270	05:01	301
Sandnes	44,786	84:58	5098
Tynset	4,118	06:04	364
Vefsn	10,379	15:39	939
Control Municipalities			
Austevoll	3,236	65:22	3922
Fræna	6,914	22:54	1374
Grue	4,198	05:08	308
Haugesund	24,653	05:20	320
Holmestrand	7,741	14:13	853
Høyanger	3,345	05:37	337
Karmøy	28,526	17:03	1023
Kautokeino	2,289	06:48	408
Løten	5,701	14:29	869
Luster	3,720	19:46	1186
Molde	18,759	19:01	1141
Rana	19,380	23:32	1412
Sande	5,928	12:01	721
Søgne	7,185	02:27	147
Sortland	7,278	07:12	432
Sør-Varanger	7,253	04:58	298
Sveio	3,511	10:21	621
Tysfjord	1,648	07:38	458
Vennesla	9,451	17:19	1039
Vestvågøy	8,057	07:58	478

Source Data - Figure 12 – Number of Registered Voters vs Minutes Taken to Complete the Results (2011 election, pilot municipalities)

Municipality	Eligible Voters (2011)	Count Duration 2011 (min)	Count Duration 2011 (hh:mm)
Ålesund	34,535	1,447	24:07
Bodø	36,635	562	09:22
Bremanger	2,955	372	06:12
Hammerfest	7,752	397	06:37
Mandal	11,764	1,012	16:52
Radøy	3,687	268	04:28
Re	6,870	864	14:24
Sandnes	48,689	1,443	24:03
Tynset	4,163	379	06:19
Vefsn	10,456	409	06:49

Data Source - Figure 13 – Number of Eligible Voters vs Hours Taken to Complete the Results (2011 election, control municipalities)

Municipality	No. Eligible Voters (2011)	Count Duration 2011 (Mins)	Count Duration 2011 (hh:mm)
Tysfjord	1,653	417	06:57
Kautokeino	2,388	222	03:42
Høyanger	3,257	979	16:19
Austevoll	3,528	1222	20:22
Luster	3,968	1028	17:08
Sveio	3,798	1030	17:10
Grue	4,111	788	13:08
Løten	5,869	990	16:30
Sande	6,461	620	10:20
Fræna	7,084	341	05:41
Sør-Varanger	7,445	1150	19:10
Sortland	7,499	264	04:24
Søgne	7,905	452	07:32
Holmestrand	7,994	497	08:17
Vestvågøy	8,228	227	03:47
Vennesla	10,070	199	03:19
Molde	19,410	907	15:07
Rana	19,841	968	16:08
Karmøy	30,072	422	07:02
Haugesund	26,427	1253	20:53

Source Data - Figure 14 – Relationship Between Percent of Internet Usage and Time Taken to Declare Results, and Figure 15 - Relationship Between Percent of Internet Usage and Time Taken to Declare Results (without Ålesund and Sandnes)

Municipality	% Internet Votes Cast	Duration of Counting 2011 (min)
Mandal	19.81%	1,012
Bremanger	21.00%	372
Vefsn	21.55%	409
Re	22.38%	864
Hammerfest	25.89%	397
Ålesund	26.40%	1,447
Sandnes	26.99%	1,443
Bodø	29.07%	562
Radøy	31.23%	269
Tynset	31.63%	379

Annex 4 – In-depth Interview Discussion Guide

Start of Interview

Introduction

- Welcome all
- Introduce NORSTAT and IFES
- Introduce the Norway E-vote Assessment project
- Explain the purpose of the in-depth interview and the way in which the results of the interview will be used

I want to talk first about existing mechanisms for counting ballots – hand counting and electronic counting of paper ballots. What would be the normal procedure and actions of the polling/counting staff at the close of polls for the counting of ballots and tabulation of results (choose the method used by the election officer):

- With hand counting of paper ballots
- With electronic counting of paper ballots

In your experience, how actively are candidates, party/candidate agents, election observers and the media involved in monitoring this process?

If the stakeholders are actively involved, how does this active involvement manifest itself?

- If participants are not forthcoming, then prompt by asking if those monitoring the process will:
    - Scrutinize the counting of ballots
    - Challenge determinations of ballot preference made by counting staff
    - Observe ballots, which are sent to counting supervisors for higher scrutiny and adjudication
    - Copy the results protocol from the polling station

Overall then are you confident that hand counting and electronic counting of paper ballots lead to results, which reflect the will of the voters?

- If not, then why not and what could be have been done to improve the processes
- Are there differences on the opinions expressed between experiences of hand counting of ballots and electronic counting of ballots, and if so, which system is seen as better reflecting the will of the voters?
- Probe why participants take the view that they have expressed.

Are there other transparency mechanisms that could be used to ensure or improve trust in the existing counting and results tabulation systems?

The recent local elections in Norway have seen Internet voting pilots in ten municipalities. Do you believe that this is a positive development for the conduct of elections in Norway?

- Probe reasons for any answers given

With the Internet voting system piloted at the recent local elections, what transparency mechanisms were available to stakeholders so that they can convince themselves that the Internet voting results generated are an accurate reflection of the will of Internet voters?

Did stakeholders in your pilot municipality avail themselves of any of these means of monitoring the Internet aspect of the count and results tabulation?

Of the three systems of counting and results tabulation – hand counting of paper ballots, electronic counting of paper ballots, and electronic counting of Internet votes – how would you rank the systems in terms of confidence that they produce results which reflect the will of the voters ?

- Rank from highest confidence to lowest confidence

The use of Internet voting involves a centralization of some parts of the election administration process, especially when it comes to counting and vote tabulation. Is this loss of local control over parts of the electoral process any cause for concern?

- If so, why is it a cause for concern and are there ways of mitigating these concerns

Overall do you trust that electronic counting of Internet votes will produce results, which reflect the will of the voters?

- Probe the reasons for all opinions expressed
- If not, then what could be done to improve the accuracy and level of trust in the counting of Internet votes

In the light of your experiences with Internet voting in this pilot, would you recommend the continuation of Internet voting and, if so, with any variations or amendments to the scheme tried this year?

Should it become a universal channel for voting within the country at all or only some levels of elections?

Thank you.

Annex 5 – Focus Group Discussion Guide

Start of Focus Group

Introduction

- Welcome all
- Introduce NORSTAT and IFES
- Introduce the Norway E-vote Assessment project
- Explain the purpose of the focus group and the way in which the results of the focus group will be used

Can you tell me a little bit about your involvement with elections in Norway and what role you played in the last municipal and national-level elections?

How do you generally find the election process in Norway to be in terms of its organization and its integrity?

- Probe on positive and negative reactions

With hand counting of paper ballot and electronic counting of paper ballots, what transparency mechanisms are available to stakeholders so that they can be assured that the results generated are an accurate reflection of the will of the voters?

- If no mechanisms are suggested – ask about; observing the counting; obtaining copies of results protocols from polling stations; checking polling stations results online

Overall then are you confident that hand counting and electronic counting of paper ballots lead to results, which reflect the will of the voters?

- If not then, why not and what could be have been done to improve the processes
- Are there differences on the opinions expressed between experiences of hand counting of ballots and electronic counting of ballots, and if so which system is seen as better reflecting the will of the voters?
- Probe why participants take the view that they have expressed.

Are there other transparency mechanisms that could be used to ensure or improve trust in the existing counting and results tabulation systems?

The recent local elections in Norway have seen Internet voting pilots in ten municipalities. Do you believe that this is a positive development for the conduct of elections in Norway?

- Probe reasons for any answers given

With the Internet voting system piloted at the recent local elections, what transparency mechanisms were available to stakeholders so that they can convince themselves that the Internet voting results generated are an accurate reflection of the will of Internet voters?

Of the three systems of counting and results tabulation – hand counting of paper ballots, electronic counting of paper ballots, and electronic counting of Internet votes – how would you rank the systems in terms of confidence that they produce results, which reflect the will of the voters?

- Rank from highest confidence to lowest confidence

The use of Internet voting involves a centralization of some parts of the election administration process, especially when it comes to counting and vote tabulation. Is this loss of local control over parts of the electoral process any cause for concern?

- If so, why is it a cause for concern and are there ways of mitigating these concerns?

Overall do you trust that electronic counting of Internet votes will produce results, which reflect the will of the voters?

- Probe the reasons for all opinions expressed
- If not, then what could be done to improve the accuracy and level of trust in the counting of Internet votes

In the light of your experiences with Internet voting in this pilot, would you recommend the continuation of Internet voting and, if so, with any variations or amendments to the scheme tried this year?

Should it become a universal channel for voting within the country at all or only some levels of elections?

Thank you.