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Modtagere:
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Erindringer:

Christina Løtzsch Hansen

Fra: Nicoline Nyholm Miller
Sendt: 7. september 2012 14:37
Til: Mikael Buchholtz (MBZ@pwc.dk)
Emne: E-valg - sikkerhedsforanstaltninger

Kære Mikael
Jeg har opgivet en mere indgående beskrivelse af de forskellige sikkerhedsforanstaltninger præsenteret i de forskellige løsninger og går mere efter en opremsning. Jeg har foreløbig nævnt følgende – vil du øje dem igennem og melde tilbage, om der er nogle vigtige nogen, jeg har glemt? Tak! Og god weekend, når du når så langt. Regner med at sende en ny version af rapporten om et par timer eller tre.

Mange hilsener,
Nicoline

"Among the safeguards mentioned were the following, which do not necessarily apply to all solutions, but are useful to keep in mind when considering the requirements for a future Danish e-voting solution:

- Strong **layer-upon-layer cryptography** applied to ballots, software, etc.
- Production of **zero tallies** before the polling commences to prove that the ballot box is empty – the zero tally can be designed in such a way that it will automatically erase anything in the memory component if something should accidentally or deliberately be stored there,
- Possibility to employ **time locks** to ensure that the system can only be activated at a fixed time, e.g. during the poll,
- System **integrity, availability and authenticity tests**,
- **Ballots are not stored electronically on the EVMs**,
- Ballots are **decrypted by a quorum** after the polls are closed, and the decryption keys are created only by the quorum after the election,
- Systems (e.g. holograms etc.) **prevent ballots from being copied, submitted, and/or counted multiple times,**
- Security against **electromagnetic eavesdropping,**
- **Tampering and malfunction alarms,** which either go off with a loud sound in the voting booth or are communicated more discreetly to the polling supervisor via a headset,
- **Entrances in EVMs are secured** with physical keys and strips/seals,
- **Mathematical proofs** of decryption and counting are run after the elections to make sure that the ballots have not been tampered with and that the system has functioned correctly,
- All **hardware is stand alone** during the polling hours,
- **Ballots are shuffled** before they are decrypted to protect privacy and secrecy of the vote,
- Storage of **images of every ballot,**
- **Cameras** survey data centres,

- **Restriction of access** to core services differentiated according to user identity or user role & requirement of **user authentication,**

- **Splitting of security keys and passwords** between two or more trusted polling supervisors or members of the election committee, so no official can start or close the system and/or procedure the results alone."

Valgkonsulent, Kommunaljura
Nicoline Nyholm Miller

økonomi og
indenrigsministeriet

Slotsholmsgade 10-12
1216 København K
Telefon 72 28 25 22
Fax 72 28 24 01
valg.im.dk

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Cc: Marianne Søgaard
Emne: Rapport igen [KA-Active.FID252410]

Jeg sender lige rapporten igen, da jeg kan se, at du af en eller anden grund ikke fik den endelige version hos mig.

Dette er min endelige version.

Mvh
Milena

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Technical dialogue on system for e-voting in Denmark – Summary report

Contents

Executive summary

Following a written request of 27 January 2012 from the mayors of 12 municipalities in Denmark and Local Government Denmark (KL) for permission ~~to be allowed~~ to conduct binding trials with e-voting at statutory elections, the Danish government decided on 6 March 2012 to grant all municipalities that wished to do so permission to conduct e-voting pilots, where the result of the poll is binding.

This decision entails that the Danish election legislation will have to be amended, as it currently implies that voting for statutory elections is done by using a paper ballot and some sort of writing utensil. The Minister for Economic Affairs and the Interior will consequently introduce a Bill to the Danish parliament, ~~which is~~ scheduled ~~to happen sometime in~~ for January 2013.

As part of the preparation of the legislative and subsequent tender processes, the Ministry of Economic Affairs and the Interior wished to explore the possibilities that the market has to offer at this point in time, and to get an overview of the economic implications of introducing e-voting in Denmark. The Ministry has therefore conducted a technical dialogue with 7 economic operators in the period of 21 August – 3 September 2012. The dialogue was carried out in accordance with the rules of the EU Procurement Directive and the lines indicated by information notice no. 2012/S 122-201846 of 28 June 2012.

The 7 ~~companies/partnerships~~economic operators ~~were~~ selected out of a total number of 11 applications on the basis of their documented experience with ~~the~~ development, implementation and operation of electronic voting and counting systems for elections to popularly elected organs. The economic operators ~~applicants~~ were informed that a future e-voting system in Denmark will be used only for non-remote electronic voting in a controlled environment at polling stations on election day and/or for advanced voting on the premises of the municipalities; not for voting over the internet or by other remote voting channels.

The technical dialogue has brought to the Ministry the recognition that there are many economic operators working seriously with e-voting that bring to the customer a wide experience in the field and which have been designing and providing e-voting and e-counting solutions for a number of years. The economic operators invited to the technical dialogue have been involved in providing e-voting solutions for statutory elections in many different countries in the world as well as for numerous organisations.

~~According Based on to the discussions with~~In the opinion of the economic operators ~~studies of academic research and international experiences as well as the dialogue with the companies~~ participating in the technical dialogue, the following ~~Ministry finds that the~~ main ~~benefits~~ advantages can ~~to~~ be derived from employing a digital voting and/or counting system ~~are~~:

A. More accurate count and tally
B. Voter verifiability
C. Provides the disabled with the opportunity to vote without assistance
D. Eliminates spoiled ballots while keeping the option to cast a blank vote
E. Additional 'back-up' storage of ballots
~~F.~~ ~~Faster count and result~~ results & reduction of administrative resources for manual count
F.

The Ministry recommends that the municipal councils ~~that~~which are considering to engage ~~engaging~~ in e-voting pilots have a thorough discussion of these ~~enlisted~~ and other possible potential benefits of e-voting and/or e-counting, and ultimately decide which of these should be guiding for the municipalities' overall strategy for conducting e-voting and/or e-counting pilots.

Formateret: Automatisk nummerering + Niveau: 1 + Nummereringstypografi: A, B, C, ... + Begynd med: 1 + Justering: Venstre + Justeret: 0,63 cm + Indrykning: 1,27 cm

In the opinion of the consulted economic operators, t~~T~~he greatest risks or pitfalls of introducing and employing e-voting and/or ~~(to a lesser extent)~~ electronic counting is ~~in the opinion of the consulted vendors~~ not so much a question of technology flaws or security issues, but more of *perception* and *trust*.

For this reason, some economic operators~~vendors~~ recommend introducing e-voting by a step-by-step approach, starting out slowly and giving the voters sufficient time to familiarise themselves with the changes and get to trust the system by seeing it work in a satisfactory way in numerous elections.

All ~~Most~~ economic operators that the Ministry has consulted with ~~vendors~~ can provide customized solutions and employ a modular methodology. The economic operators ~~vendors all~~ operate in several different countries with a large variety of election systems, where the lesson learned and imparted to the Ministry during the technical dialogue is that no two election systems are the same, sometimes not even within the same country (e.g. USA).

~~This entails in turn that the Ministry and municipalities will have to make a number of choices together to find out which requirements best fit the Danish election traditions, as t~~here is no 'fool proof' ready-made solution that can just be picked off the shelf and employed successfully for e-voting in any given country, including Denmark. Hence~~Therefore~~, if Denmark proceeds with the plans to make its own experiences with e-voting, a number of **choices** will have to be made by the politicians, *inter alia* whether we should opt for a ~~sophisticated ballot generator~~ solution that generates a ballot, or op t for ~~whether most of the same benefits can be achieved satisfactorily with a more simple and cheaper~~ a solution with an electronic ~~optical~~ ballot scanner ~~solution~~ with a counting and tallying functionality.~~device that enhances the method in which votes are counted, whilst minimising the changes to the way in which votes are cast.~~ Other things to consider are for example~~:~~ the pros and cons of choosing a dedicated versus a commodity hardware solution, how the ~~whether the~~ votes should be recorded, ~~e.g. on the e-voting machine (DRE) or by a scanning device connected to the ballot box,~~ whether – i~~f~~ opting for a ballot generator of some kind – voters ~~voters~~ should be offered the opportunity to verify not only the human readable imprint of the vote, but also any electronic record (bar code or similar), the kInd of accessibility functionalities the e-voting solution ~~it~~ should offer for the disabled, whether it should be a requirement that the system is open source, and to what extent, and ~~finally~~ the intended use of the system: is it just for voting at polling stations on election day, or should it also be able to handle mobile advance voting for instance?

Kommentar [man1]: Det bør overvejes at anvende "disadvantages", da termonologien bedre afspejler dagsordenens punkt.

Formateret: Mellemrum Før: 0 pkt.

Kommentar [man2]: For detalleret.

Kommentar [man3]: Jeg foreslår, at afsnittet udgår, og der blot henvises til punkt 8, da afsnittet er en gentagelse af punktet. Hvis I ikke sletter afsnittet bør der sikres overensstemmelse med punkt 8.

1. Introduction

This report contains a summary of the ~~the discussions conducted~~information received during the technical dialogue between the Ministry of Economic Affairs and the Interior with 7 economic operators on a system for electronic voting ~~in Denmark~~, as well as a short description of the technology demonstrated by the economic operators. In addition, the report includes a tentative estimate of the probable economic implications of introducing e-voting in Denmark for statutory elections based on the data delivered by the economic operators in the technical dialogue.

Following a written request of 27 January 2012 from the mayors of 12 municipalities in Denmark and Local Government Denmark (KL)[1] to be allowed to conduct binding trials with e-voting at statutory elections, the Danish government decided on 6 March 2012 to grant all municipalities that wished to do so permission to conduct e-voting pilots, where the result of the poll is binding.

The Minister for Economic Affairs and the Interior, who *inter alia* is responsible for all statutory elections in Denmark, stated the following in her press release of 13 April 2012 on the government's decision to allow pilots on electronic voting:

> "We have to modernise the public sector, which makes it natural to exploit the opportunities offered to us by new technology – also with regard to elections. The pilots shall show whether e-voting offers any significant benefits, which can entail that we should consider digitalising the polling in the longer term.
>
> One of the benefits is that e-voting can eliminate the pile of spoiled ballots, where the election officials are in doubt about where the voter intended to cross the ballot. Another benefit is that e-voting will enable the visually impaired to vote without assistance. Also, e-voting can render the manual count unnecessary on the longer run, which can save the municipalities some resources.
>
> The challenge is whether it is possible to make e-voting secure enough and keep it within an over-all proper financial framework, which the pilots shall also contribute to clarify. I hope that the municipalities will draw some good experiences from the e-voting pilots so that the technology can be spread out to the whole country."
>
> *Margrethe Vestager*

Before the government and municipalities can move on to a procurement process, the Danish election legislation will have to be amended, as it currently implies that voting for statutory elections is done by using a paper ballot and some sort of writing utensil. The Minister for Economic Affairs and the Interior will consequently introduce a Bill to the Danish parliament, currently scheduled for January 2013.

Purpose of e-voting pilots from the municipalities' point of view

In their letter of 27 January 2012, the 12 municipalities stated that the overall purpose of carrying out one or more e-voting pilots would be to obtain experience with e-voting in a Danish context that could feed into the decision process re. a more general introduction of e-voting in Denmark. The municipalities therefore stressed the importance of a thorough evaluation following the first pilots. The evaluation should *inter alia* focus on technical security, possibility of independent auditing and public control and the voters' experiences related to the employment of an e-voting system with the aim of securing public acceptance of digitally supported elections.

Formateret: Mellemrum Før: 6 pkt.

The aim of the municipalities with regard to conducting the first binding e-voting pilots are in particular to establish whether e-voting can:

- improve the accessibility for voters with disabilities, in particular for the blind and visually impaired as well as dyslectics, and to enable more voters to vote independently,
- eliminate the involuntarily spoiled votes (i.e. not the blank votes, which should still be allowed),
- be carried out while retaining a high degree of public control and high system- and operational reliability,
- make the recount redundant, or at least lead to a reduction of the administrative resources deployed for the count and recount,
- result in cost improvements for the municipalities on the longer run.

The starting point of the municipalities was thus to gain some experiences on the operation of a system for electronic ballot generating to be employed at the polling stations and/or for advance voting in a controlled environment, and that offers special accessibility functionalities for the disabled and can provide an electronic count and tally.

The Ministry's and the municipalities' firsthand knowledge of different e-voting solutions to the challenges mentioned above were at this point in time in the early Spring somewhat limited. It was therefore decided to engage in ~~discussions~~ dialogue with key stakeholders at this early stage about the benefits and risks of e-voting and which requirements should be made to allow e-voting in a Danish context, and to ~~study~~ get an overview of different e-voting solutions.

Kommentar [man4]: Foresiår terminologien advantages and disadvantages

Process preceding the technical dialogue

As a first step, the Ministry organised a workshop[2] on 15 May 2012 in collaboration with the Demtech research project[3] at ITU (IT-University of Denmark) and the Danish Board of Technology with the participation of more than 40 representatives from the IT-community, the municipalities, IT- and social sciences researchers, election experts, interest organisations for *inter alia* the disabled, civil and human rights, the elderly, etc. The purpose of the workshop was to engage key stakeholders as early as possible in the process and gather their input on the desired requirements for a future e-voting system in Denmark, including the necessary procedures for the preparation, safeguarding and carrying out of electronic voting and -counting.

The Ministry works in close collaboration with the municipalities and participates in the steering committee set up by the 12 municipalities and KL to monitor the e-voting project. In consultation with the steering committee, the Ministry decided in the late spring of 2012 to conduct a technical dialogue with economic operators in the field of electronic voting to acquaint itself with the current technological solutions.

In return for the commitment of the Danish government to introduce a Bill that will permit those municipalities that wish to do so to employ electronic voting and counting at statutory elections, the Minister for Economic Affairs and the Interior has asked the municipal councils of the 12 municipalities that originally applied for permission to conduct e-voting pilots for a binding declaration by the 1st of October 2012 of their commitment to allocate the necessary economic and administrative resources ~~necessary~~ required for conducting one or more e-voting pilots.

Shortly after 1 October 2012, the Ministry will decide whether to proceed with its efforts to create the necessary statutory authority to enable municipalities to employ e-

voting at statutory elections. If a sufficient number of the 12 municipalities have committed themselves, the Ministry will as previously mentioned prepare the necessary draft legislation during the autumn 2012 with the aim of introducing a Bill to the Folketing (the Danish parliament) in January 2013. Provided that the Bill is passed, the Ministry and the municipalities will work together to present an invitation to tender in the spring, summer or early autumn of 2013, depending on when the legislative process is concluded.

2. Purpose of the technical dialogue

Prior to the probable tender procedure for the supply of a system for non-remote electronic voting and counting (hence referred to as an 'e-voting system'), the Ministry of Economic Affairs and the Interior has conducted a technical dialogue with 7 economic operators. Invitation for participation requests to the technical dialogue was issued on 28 June 2012 in TED, the online version of the 'Supplement to the Official Journal of the European Union' dedicated to European public procurement, where the conditions for participation were also stated.[4] The deadline for request by economic operators to participate in the technical dialogue was set to 3 August 2012 at 12:00 noon CEST.

~~As mentioned above, the Ministry has asked the 12 municipalities that have previously expressed their interest in conducting e-voting trials for a binding commitment to allocate the necessary resources to do so. In order to facilitate the decision process of the municipal councils on this matter, the Ministry has promised the councils to provide information on the technical, procedural and economic implications of introducing e-voting technology in statutory elections.~~

Kommentar [man5]: Gentagelse

Hence, the purpose of the technical dialogue meetings was two-fold:

1) Part of a 'feasibility study' to give the municipalities a better basis of decision to commit themselves to conduct one or more e-voting trials;

2) To give the Ministry and municipalities an overview of existing technical solutions, thus providing a better ground for drawing up the requirements in a future tender process for the acquisition of an e-voting system.

Kommentar [man6]: Dette fremgår ikke af forhåndsmeddelelsen. Foreslås flyttet til punkt 1.

~~As part of the preparation of the tender process, the Ministry of Economic Affairs and the Interior wished to explore the possibilities that the market has to offer at this point in time, and to get an overview of the economic implications of introducing e-voting in Denmark.~~

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Kommentar [man7]: Gentagelse. Foreslås slettet.

The Ministry of Economic Affairs and the Interior was interested in consulting with economic operators~~companies~~ that have documented experience with the development, implementation and operation of electronic voting systems for larger organisations~~companies~~ /institutions, including in particular public institutions. Preference was given to economic operators~~companies~~ that have experience with the development and implementation of electronic voting and counting systems for elections to popularly elected organs.

Kommentar [man8]: Gentagelse. Foreslås slettet.

3. The official announcement

The dialogue was carried out in accordance with the rules of the EU Procurement Directive[5] and the lines indicated by the prior information notice no. 2012/S 122-201846 of 28 June 2012.

The official announcement of the technical dialogue can be found on ted.europa.eu, the online version of the 'Supplement to the Official Journal of the European Union'[6], dedicated to European public procurement.

The rules on the right to enter into a technical dialogue with the market are found in point 8 of the recital in the EU directive on public procurement. The rules have been implemented into Danish law by Executive Order no. 712 of 15 June 2011[7] (in Danish) on the procedures for the award of public works contracts, public supply contracts and public service contracts.

4. Selection of participants

Selection criteria

Particularly out of regard for the resources allocated by the Ministry to carry out the preliminary study, the Ministry decided that a maximum of eight ~~companies~~economic operators/partnerships would be invited to the technical dialogue. In the event that more than eight ~~companies~~economic operators/partnerships requested to participate in the technical dialogue, the Ministry of Economic Affairs and the Interior would invite all ~~companies~~economic operators/partnerships that have documented experience with development, delivery, implementation and operation of electronic voting systems for larger ~~companies~~organisations/institutions, including in particular public institutions. If more than eight ~~companies~~economic operators/partnerships could document such experience, the Ministry would select those ~~companies~~economic operators/partnerships that have documented experience with the development and implementation of electronic voting and counting systems for elections to popularly elected organs, i.e. elections for national or local parliaments or governments etc. In the event that there henceforth were more than eight ~~companies~~economic operators/partnerships qualified for selection according to the above mentioned criteria, lots would ~~ill~~ be drawn amongst these.

~~Companies~~Economic operators ~~-~~selected

The Ministry received 11 requests for participation, of which the following 7 ~~companies~~economic operators/partnerships were invited to individual meetings on basis of the enclosed documentation of experience with e-voting at statutory elections:

- Indra
- Opt2vote
- Everyone Counts
- Assembly Voting (Aion & Siemens)
- Scytl & Zetes
- KMD & Smartmatic
- DRS Data Services & Dominion Voting

Procedure

For each invited economic operator~~company~~ or partnership the technical dialogue consisted of one bilateral meeting between the economic operator(s) ~~company/ies~~ in question and the Ministry of Economic Affairs and the Interior and its partners. The meetings each lasted approx. 3 hours, of which approx. 45 minutes were set aside for a demonstration of the e-voting system of the the economic operator(s) ~~company/ies~~ in question.

The meetings took place during the period of 21 August – 3 September 2012. All applicants were informed that participation in the technical dialogue is neither a precondition for participation in the anticipated procurement, nor will it improve the chances of participating economic operators for eventual prequalification. The ~~companies~~economic operators ~~-~~were informed that the Ministry as a public authority is subject to the Danish Public Records Act and thus can be obliged to give access to documents etc. to the extent following from its obligations under this Act, but that any request for confidentiality re. information imparted during the oral technical dialogues would be respected by the Ministry as far as possible.

Framework

The the economic operators ~~applicants~~ were informed that a future e-voting system in Denmark will be used only for **non-remote electronic voting** in a controlled environment at polling stations on election day and/or for advanced voting on the premises of the municipalities; not for voting over the internet or by other remote voting channels. The system should thus be employable for the following phases: preparation of the equipment before the election, polling, counting and notification of the results as well as packing and storing.

The system should also be adaptable to the Danish context and election traditions, i.e. *inter alia* be designed to secure a high degree of recognisability for voters and a continued high trust in elections. The Danish turn-out is among the highest in the world for countries where voting is not mandatory (87.7 per cent at the last general election in September 2011; approx. 65 per cent at local elections). The system must therefore be designed in such a way that the high turn-out and trust in elections are maintained.

Digitalization of the polling implies that some of the control mechanisms meant to ensure public control with the elections will be replaced by digitalized procedures, which can only be checked by specialists with particular insight in it-systems etc. Public control mechanisms in a Danish context would e.g. be the demonstration and subsequent sealing of the empty ballot boxes in front of the voters in attendance before the elections commence at 9:00 a.m., and the voters' right to watch the manual count of the votes after the election is closed at 8:00 p.m. To ensure a continued high trust in elections – hitherto obtained and preserved *inter alia* via the aforementioned public control mechanisms – the Ministry was therefore also interested in obtaining information on alternative control mechanisms, which provide the voter with a comparable high degree of trust that the polling has progressed correctly, i.e. without system failures or any manipulation with the elections. The system should also be trustworthy and robust and ensure that the election can continue even if the system malfunctions partly or completely during the polling.

The system should also guarantee the secrecy of the vote, which in the Danish context entails that the voter not only has the *right* to keep his/her vote secret, but is also under the *obligation* to do so, i.e. the voter is not free to show his/her vote to others. In addition, it must be impossible to connect a voter and the vote he/she has cast, including indirectly by e.g. logging or electronic detection of screen displays or the like by external devices etc.

The system should finally also be user-friendly and readily accessible to all voters, including voters with disabilities. The Ministry was therefore interested in a presentation of any measures that could render the polling more accessible to voters with disabilities, preferably allowing them to vote without assistance.

5. Meeting agenda

Before each meeting, the Ministry of Economic Affairs and the Interior sent out an agenda to all participating ~~companies~~economic operators, where it was stated that the Ministry wished to gain closer insight into *inter alia* the following issues:

1. Protection of the secrecy of the vote in general by the e-voting system.
2. Protection of the secrecy of the vote in particular by the use of dedicated hardware vis-à-vis the use of non-dedicated hardware, including processes for safe destruction of sensitive data.
3. The securing by the e-voting system that the polling has passed off without incident, including by the production of a physical manifestation of the vote (VVPAT or similar) that can both offer sufficient proof to the voter that the polling has passed off correctly and be included in a manual recount.
4. The safeguarding by the system of correct polling and registration of the vote and the possibility to control that the system has not failed or been manipulated along the way (security).

5. The possibility to secure accessibility to the system for the disabled.
6. The economic implications of introducing the e-voting system of the company/ies in question in Denmark, divided into the expenses for a) the purchase or leasing/accommodation of hardware, b) the purchase or leasing of soft ware, c) service and operation, back-up, training, maintenance etc.
7. Possibilities for further development of the system and possibilities to adjust the e-voting system for future needs and update it to exploit new technological possibilities (possibility for agile development and innovation).
8. Possibility of scaling of the system, including information on the possibility to separate the polling and counting functionalities, so that the system initially could be limited to ballot marking, but later can be connected to a digital counting device if desired.
9. Usability in general and for the disabled in particular
10. Advantages and gains of e-voting in general and in particular from employing the e-voting solution demonstrated

6. Benefits and risks of electronic voting and counting

Benefits

According to the ~~discussions with~~information received from the economic operators participating in the technical dialogue, the following main benefits can be derived from employing a digital voting and/or counting system:

A. More accurate tallying

Electronic counting can ~~undoubtedly~~ offer more accurate tallying and as good as eliminate human errors in the counting process. Sharing their experience re. manual counts conducted to audit the electronic tallying, one of the ~~vendors~~economic operators described as a common incident that a new result is usually reached each time the votes are recounted by hand. Only after an audit unit is brought in and three auditors have counted the ballots together and have agreed on the result the numbers will come out exactly the same after each count, and they incidentally match the results of the electronic tallying.

~~A couple~~Some of the economic operators recommended that when ~~Lessons learned: When~~ manual counts are to be conducted for audit purposes after the electronic tallying (either as a complete recount or random checks), a proper procedure should ~~must~~ be implemented to minimize human error. E.g. counts should be undertaken by independent auditors or officials that have not been participating in the election all day, where the risk of them not being capable of conducting a recount under optimal conditions is significantly enhanced compared to if you bring in a "fresh" team. Also, the recount should be undertaken in teams of 2 or 3, where all individuals must agree on the result before it is compared with the electronic tally.

B. Voter verifiability

~~Unlike the paper-based tallying process, which happens after the voter introduces his/her ballot in the ballot box and is carried out by election officials, a~~All the demonstrated electronic counting systems offer the voter the possibility to scan his/her ballot ~~vote~~ before inserting it in the ballot box either manually or by transitional [.....manger noget] Hence, the voter is enabled to verify him/herself that the vote is actually counted, which is not possible in paper based elections. ~~which could further augment the voters' trust in the election system.~~

C. Provides the disabled with the opportunity to vote without assistance

All the systems demonstrated during the technical dialogue include features that are designed to enable voters with disabilities to cast their vote without assistance.

Kommentar [man9]: Advantages and disadvantages

Kommentar [man10]: I bør overveje at flytte punktet til sidst før Choices to be made, idet det giver bedre mening og stemmer bedre overens med systematikken i dagsordenen.

Kommentar [man11]: advantages

Kommentar [man12]: advantages

Kommentar [man13]: For detalieret og bidrager ikke med noget. Foreslås slettet.

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The range of disabilities covered by the different solutions and their usability vary, but all do to some extent ~~undoubtedly~~ make it possible for some groups of disabled voters to cast their vote unsupervised (cf. section 7.5. below).

D. Eliminates spoiled ballots while keeping the option to cast a blank vote

In the experience of the Ministry, the large majority of these ~~-~~ spoiled votes have not been purposefully spoiled by the voters; the majority of the voters having cast a spoiled vote other than a blank vote are thus under the wrong impression that their vote has been correctly cast and counted and forms part of the overall result.

~~As discussed with~~ According to the economic operators, w~~W~~hile the number of spoiled votes[8] ~~is number~~ may not seem very significant in the overall ~~picture and at least for parliamentary elections is not likely to have had any decisive influence on the election results taken as a whole~~, ~~the Ministry finds~~ it is problematic from a democratic perspective that a noteworthy number of voters unknowingly and involuntarily have cast an invalid vote. In addition, in local municipal elections, where the results sometimes differ by a few votes only, it ~~the Ministry~~ cannot in principle be ruled out that the spoiled votes could have a decisive influence in some municipalities, from the results of the contest between candidates to the actual party nominated for the post of mayor. According to views expressed by some of the economic operators ~~Hence, the Ministry finds that~~, the possibility to eliminate or at least significantly reduce the number of spoiled votes other than the blank votes is another important benefit to take into account in the decision on whether ro introduce e-voting ~~should be introduced in Denmark~~.

E. Additional 'back-up' storage of ballots

~~Another benefit of e-voting and/or counting that some of~~ According to the ~~vendor~~economic ~~have~~operators ~~have emphasized and that has not previously been considered in the Danish debate is~~ the e-voting solutions contain ~~the~~ an extra security provided by the electronic storage of the ballots and results in parallel with the physical storage of the paper ballots ~~or VVPAT's~~. This offers redundancy, as the result of the poll can be reproduced if for some reason the paper ballots ~~or VVPAT's~~ should be damaged, destroyed or lost, thus avoiding a second ballot as the ultimate consequence if a significant number of ballots cannot be produced for the count or recount for one of the reasons previously mentioned.

F. Faster count and results & reduction of administrative resources for manual count

E-counting *ipso facto* enables a much faster tally and result. The economic operators ~~concurred~~informed that a faster and more accurate count and tally ~~probably~~ also offers significant advantages from the administrative point of view of the municipalities, in that ~~. In line with this, some vendors highlighted~~ it can lead to a ~~the~~ reduction of resources allocated to the manual count and particularly to the recount (which could on the long run become redundant) ~~as an advantage~~. However, this advantage would only manifest itself over time, and should be weighed against ~~it is at this point uncertain whether it will measure up to~~ the increased economic implications of procuring and maintaining e-voting equipment and the ~~, not to mention the~~ additional staff that will ~~in all likelihood~~ be required to set up, run and pack the equipment after the election.

On basis of the ~~discussions with~~information received from the economic operators on the different potential benefits of e-voting, t~~T~~he Ministry finds ~~recommends~~ that the municipal councils which are considering to ~~engage engaging~~ in e-voting pilots should have a thorough discussion of the enlisted and other possible potential benefits of e-voting and e-counting, and ultimately decide which of these should be guiding for the municipalities' overall strategy for conducting e-voting and/or e-counting pilots.

Formateret: Indrykning: Venstre: 0,63 cm

Kommentar [man14]: Alle de andre punkter indeholder beskrivelse af de presenterede systemer i relation til punktet. Den mangler her. Jeg foreslår at punktet omformuleres, så det ligner de andre.

Kommentar [man15]: Dette er slettet andre steder. Bør også slettes her.

Formateret: Ingen understregning

Risks and pitfalls

The greatest risks or pitfalls of introducing and employing e-voting and/or (to a lesser extent) electronic counting is in the opinion of the consulted ~~vendors~~economic operators not so much a question of technology flaws or security issues, but more of *perception* and *trust*.

For this reason, some ~~vendors~~economic operators recommend introducing e-voting by a step-by-step approach, starting out slowly and giving the voters sufficient time to familiarise themselves with the changes and get to trust the system by seeing it work in a satisfactory way in numerous elections. Some economic operators also ~~One vendor~~ pointed out that in their experience voters are generally receptive and positive towards the introduction of technology in the election realm, while scepticism is often mainly expressed by candidates and political parties. Therefore, it is important to conduct independent audits after the elections that can prove beyond any reasonable doubt that the election has not been tampered with and that the results have been correctly counted and tallied.

Notwithstanding, as also ~~discussed~~ pointed out ~~with~~by the economic operators, ~~Naturally,~~ the issues of *security against malfunction and manipulation* of an e-voting system as well as the matter of preserving the voter's privacy and the secrecy of the ballot are equally very important issues to consider and protect when drawing up the requirement specifications for a future e-voting/e-counting solution and during the procurement process~~, see further below~~.

7. Demonstration of solutions

The Ministry was presented with 7 ~~different approaches and~~ solutions for digital voting and/or counting. Based on the description given in the EU information notice of the preliminary considerations by the Ministry and municipalities as to the framework of the upcoming e-voting pilots, the ~~vendors~~economic operators presented **six different ballot generating systems** with the optional possibility of adding e-counting devices and **one ballot scanner solution**. The economic operators ~~All but one vendor~~ offered a demonstration of some of their voting/counting equipment that the ~~vendors~~economic operators estimated would be relevant in a Danish context.

~~The range of systems demonstrated can roughly be divided into two:~~

~~1) electronic **voting** solutions with the option of electronic counting and tallying,~~

~~2) electronic **ballot scanning**, counting and tallying solutions.~~

The e-voting and –counting solutions demonstrated were for the most part only one of more options ~~few~~ among many other different solutions and services that the ~~vendors~~economic operators could provide. Examples of other electronic voting schemes and services where briefly touched upon during ~~some of~~ the ~~vendors~~economic operators' presentations (e.g. internet voting remotely or via connected terminals at polling stations, central optical scanners, DRE's with or without paper trail, election management solutions, etc.), but will not be further discussed or described in this report.

Ad 1) ~~Solutions with~~ Ballot generator solutions~~electronic voting~~

All ~~e-voting solutions (i.e.~~ ballot generator solutions~~s)~~ demonstrated are more or less structured the same way:

~~The voter goes to his/her polling station and presents his/her polling card, which is matched against the current manual or electronic electoral register.~~ After being matched against the electoral register at the polling station, t~~T~~he voter is handed a token ~~,~~ which can either be a smartcard with a chip similar to a credit card or a ~~credit card sized~~ cardboard card with an integrated RFID-chip. The token can either be

Kommentar [man16]: Terminologi

Kommentar [man17]: Terminologi

Kommentar [man18]: Man kan overveje at korte afsnittet endnu mere, da en del af oplysningerne bliver gentaget senere.

Kommentar [man19]: Er Op2vote med i denne gruppe?

Kommentar [man20]: Rapporten bør gennemgås for at sikre at denne terminologi anvendes. Der er mange steder hvor der tales om EVM solution.

Kommentar [man21]: For teknisk. Overvej at slette.

handed to the voter, or the voter can choose any random token from e.g. a tray to enhance the voter's trust that his/her privacy is protected and that the token does not contain any personal information on the particular voter.

The token can ~~either~~ be initialized before the election ~~(which will take time)~~ or for reasons of time constraint and transparency be initialized at the polling station by the election official in front of the voter ~~before it is handed to the voter~~ or ultimately by the voter him/herself~~, again with the purpose to convince the voter that no personal information is stored on the token~~. The token ~~will be activated and~~ can be stored with particular information identifying e.g. the voting district that the voter belongs to (which is handy if the voter is e.g. voting in advance and needs a different ballot than the one that corresponds to the particular municipality where the advance voting is taking place) or whether the voter is disabled and special features need to be activated in the EVM, e.g. the screen should be turned off etc.

The voter ~~enters the polling booth and~~ inserts the token into the ballot generator ~~(EVM)~~ placed in the polling booth. The token ~~machine is~~ initializes the machine and ~~d and the ballot interface~~ activates the ballot interface~~d so the voter can make his/her choice~~. All solutions demonstrated employ a touch screen, ~~so~~ where the voter makes his/her choices by touching the different options on the screen. Some solutions in addition offer a digital pen for voters who prefer to use such a device. Most solutions offer a multiple layer solution, in which the voter first is presented with a frame enlisting the different parties and the option to cast a blank vote. If the voter wishes to cast a preferential (personal) vote for a particular candidate, the voter has to choose the party that the candidate belongs to in order to be presented with a new frame showing the different candidates that are standing for the party in question. The interfaces shown varied a great deal in design and usability ~~(some tried to the design of the actual Danish ballot paper, others opted for a more simple design)~~, but all ~~vendor~~economic ~~assured~~operators assured that the interface could be customized to fit the customer's wishes.

Kommentar [man22]: For detalleret. Foreslås slettet.

The voter then has to confirm his/her choice ~~(always retaining the option to have second thoughts and change their choice right up to the step where the voter is asked to finally confirm)~~ and a ballot ~~(VVPAT)~~ is printed by the machine. Systems employing smartcards will print a separate ballot on paper (different qualities and thicknesses were demonstrated, but can almost always be customized), where the vote is printed in both a human readable format (fonts etc. can be customized) and a 2D ~~QR~~ bar code ~~(for scanning purposes~~ that ~~will~~ enables electronic counting and tallying~~) and handed to the voter~~. ~~The bar codes displayed on the ballot papers/VVPAT's are encrypted and cannot be read with mobile phone QR scanners or similar, but have to be decrypted first.~~ ~~If the S~~systems ~~employings~~ a card board card with RFID will print ~~, the vote will be printed~~ vote in a human readable format on the same card ~~that was~~ used to initialize the EVM and store ~~and returned to the voter. T~~the encrypted electronic readable reproduction of the vote ~~will be encrypted and either stored~~ in the RFID ~~and printed on the card in a human readable format or could also be limited to OCR recording in print with no electronic trace stored in the RFID~~ (other solutions are also being considered). ~~The bar codes displayed on the ballot papers/VVPAT's are encrypted and cannot be read with mobile phone QR scanners or similar, but have to be decrypted first.~~

Kommentar [man23]: Gentagelse. Er nævnt senere.

Kommentar [man24]: For detalleret. foreslås slettet, da oplysningerne er nævnt senere.

All solutions that include storage of the vote on a 2D bar code offer some kind of verifiability functionality, so the voter can choose to scan the bar code and verify that it corresponds to the human readable text imprinted on the ballot paper~~/VVPAT~~. The verifiability scanner can either be integrated in the EVM so the voter can immediately check the bar code in the same voting booth after the ballot is printed, or placed in a separate location, e.g. a secluded booth. ~~The last option has the advantage from a trust perspective that the voter will not have any reason to suspect that the text displayed on the screen after the scan of the bar code is not what is actually recorded in the bar code, but what the machine 'remembers' that the voter has voted).~~

Solutions that employ a smartcard entail that the smartcard has to be deposited by the voter after the voting is completed; different solutions for this were demonstrated~~this can be done either so the machine offers a functionality that "swallows" the smartcard after it has been inserted into the EVM by the voter, or alternatively (most solutions) the smartcard is handed back to the voter by the machine after the voting has been completed, and the voter then has to deposit the smartcard in a separate or hand it to e.g. the election official supervising the ballot box.~~

The voter then proceeds to the ballot box and scans the ballot him/herself and deposits it in the ballot box. Some solutions entail that the voter has to scan the ballot and then insert it manually in the ballot box, while others offer transactional operation, meaning that the ballot is placed manually in a slit or similar in the ballot box and then trapped and deposited mechanically into the ballot box. According to the economic operators, either solution

~~While a transactional method prevents the voter from leaving with the ballot/VVPAT after it has been scanned and counted, there is the risk that the ballot is not inserted correctly or inserted askew; creating a paper jam that until the ballot box is fixed by an election officer will prevent other voters from depositing their vote in the machine. Also, there is a risk that the secrecy of the vote will be compromised if the election officer has to handle the voter's ballot in the process of fixing the transactional device. Either solution will – as many of the other choices that will have to be made when choosing the kind of system that is deemed most appropriate for the Danish context –~~ require a trade-off between the benefits the different choices offer and some of the disadvantages they result in in return.

When the polling is closed at 8:00 p.m, the votes can either be counted manually and/or electronically, where after the system procedures a report of the electronic count and tally. The results can be transmitted to the central tabulation computer either by a secure wireless internet system, modem or 3G or by a USB-stick protected by passwords and encryption, etc. and then collected and inserted into the central computer and tallied there. ~~One of the systems that employ USB-sticks also stores the driver and operating system on USB-sticks and loads them into the EVM, which is empty, when initialising the ballot generator machines just before the election.~~

Common to all solutions demonstrated is that the ballot is not stored in the EVM (they are in other words not DRE-solutions[9]), but only on the printed ballot ~~VVPAT~~, until it is introduced in the ballot box, where it can be scanned and stored electronically or simply inserted for manual count without any electronic recording of the ballot. Other options briefly discussed besides printing of individual ballots include real-to-real and cut-&-drop paper recording of the vote.

Kommentar [man25]: Foreslås slettet.

~~The benefits and risks/ downsides of this type of solution can be summarised as follows:~~

~~BENEFITS~~	~~RISKS AND DOWNSIDES~~
• ~~Elimination of spoiled ballots while retaining the possibility to cast a blank vote~~	• ~~Can be difficult to use for some voters, especially during a transitional phase, and can lead to queuing by the voting booths if voters take longer to make their choice~~
• ~~Disabled and dyslectic voters can vote without assistance with special functionalities~~	• ~~Some voters will question whether the solution is secure and the privacy and secrecy of the vote is sufficiently protected~~
• ~~Voters are given the possibility to verify themselves that their vote is counted~~	• ~~Risk of negative public campaign against the EVM-solution that could seriously damage public perception and trust regardless of whether the criticism voiced is~~

	~~valid~~
• ~~Faster and more accurate count and tally~~	• ~~Introduction of black boxes and delegation of public control to experts – this risk increases the more complex the solution chosen is, .e.g. by using encrypted bar codes~~
• ~~Potential administrative savings as less manpower will be needed for a manual count and recount (on the longer run)~~	• ~~Expensive, especially compared to an optical scanner solution that only scans hand filled ballots~~

Ad 2) Optical ~~Solutions with electronic~~ ballot scanning and e-counting solutions

One ~~vendor~~ economic operator demonstrated an ~~alternative approach, in that this vendor unlike the other six does not supply a ballot generator, but~~ an optical scanner that can scan paper ballots marked by hand by the voter.

~~The first part of the procedure is similar to the procedure currently employed.~~ After being checked in the electoral register, the voter is handed a paper ballot similar to the one currently used. The design of the ballot can be customized according to the customer's wishes. The voter ~~goes to a secluded voting booth, where the voter~~ marks the ballot with a pen, ticking off or filling in a box or circle beside the party or candidate of his/her choice.

The voter then proceeds to the ballot box, which is mounted with a scanning device, ~~and~~ a tabulator ~~on top~~ and a ~~a small~~ screen ~~on the side~~. The voter inserts the ballot in the scanner, which will read the ballot and show the result on a ~~small LCD~~ screen ~~beside the scanner~~ so the ~~, allowing the~~ voter can ~~to~~ verify his/her selections ~~privately~~. The machine can via the screen alert the voter if he/she ~~If the voter~~ has under- or overvoted or somehow invalidated the vote by filling it out incorrectly, ~~a text on the screen will alert the voter and ask the voter whether he/she wishes to proceed nevertheless, or whether the voter wished to retract and exchange the ballot for a new one in accordance with the existing rules.~~ The voter can then decide whether to cast the vote or retract it if it has been filled out incorrectly and the voter wants to exchange the ballot. ~~marks his/her choice (CAST if satisfied or RETURN vote if they wish to have their ballot returned for correction or exchange to a new ballot). If the voter has chosen to cast the vote, t~~The ballot ~~will then be~~ is transitioned mechanically into the ballot box; ~~otherwise it will be pushed out of the scanner so the voter can retrieve it~~. The solution includes measures for protection the secrecy of the vote (e.g. a ~~The voter can be required to place the ballot in a~~ card board folder). ~~before scanning it to protect the secrecy of the vote.~~

In the experience of the ~~vendor~~economic operator, approx. 800 voters per hour can use the machine, but it will ultimately depend on the length and complexity of the ballot.

The solution offers a special functionality for disabled voters that can mark the ballot for them~~, see section 7.4. below for further details~~.

7.1. Protection of privacy and the secrecy of the vote

~~Protection of privacy and the secrecy of the vote are two of the most important concerns and points of attention when considering and assessing different e-voting solutions.~~ All ~~vendors~~economic operators ~~have consequently~~ been required to identify the greatest risks to privacy and the secrecy of the vote and to demonstrate how their solution mitigates the risks identified, as well as to share their experience on what technical and procedural safeguards it would be recommendable to implement.

Most solutions do not entail any connection between the identity of the voter and the ballot, as they are based on the hand out of a randomly chosen token to the voter for initialisation of the EVM and do not store the vote on the EVM, or are based on the hand out of a paper ballot like today. Some ~~Two~~ of the systems have originally been developed for the internet and do require an initial storage of both the authentication data and the vote, but ~~both~~ these systems nevertheless have technical solutions in place to protect privacy and the secrecy of the vote (separation of databases for authentication and storage of votes and 'double envelope'[10] systems).

All economic operators ~~solutions~~ have considered the secrecy of the vote in the handling of the ~~VVPAT~~ballot.

The electronically generated ballots ~~, which~~ can be folded to hide the human readable depiction of the vote and only expose the 2D bar code, which is not readable by the human eye. In addition, the bar codes are encrypted so that the bar code cannot be read by a scanner in a mobile phone or other device except for the system scanners containing the algorithm to decrypt the bar code, and no two bar codes are alike irrespective of the choice they represent. The ~~vendors~~economic operators are also all aware that the ballot should be the same length regardless of the choice it contains to retain the secrecy of the vote.

Most ~~vendors~~economic operators prefer smartcards to RFID-cards stating security reasons, claiming that ~~as~~ cards with RFID-chips could be read or jammed from a distance by hardware that is relatively cheap and easy to buy from the internet. Smartcards are according to the economic operators also cheaper than RFID-cards and can be reused many times; it is also not necessary to procure a smartcard for every voter, as they can be reinitialized after being used by a voter.

~~The one~~ Economic operators ~~vendor that~~ favourings RFID haves countered that the use of RFID allows the token to be used both to initiate the machine and to store the vote, thus reducing the complexity of the voting procedure for the voters. Additionally, the RFID-chip can according to the economic operators ~~vendor~~ be protected against eavesdropping or jamming by putting the right procedural safeguards in place. Finally, the economic operators offering a RFID-solution ~~vendor~~ contested that RFID-cards are more expensive to procure than smartcards, although it was not disputed that an RFID-solution will entail the need to buy one card for every voter and that they *ipso facto* cannot be reused.

Most solutions shuffle the votes before decryption to ensure that they are recorded in a random and different order than they were cast, so no one can restore a connection between the voter and the votes on the basis of electronic or manual time-logging or similar.

Regarding ~~the~~ optical ballot scan systems that scans a regular hand-filled ballot, the ballot has to be inserted into the scanner in its full length, i.e. it cannot be folded to protect the secrecy of the vote. However, ~~as mentioned in the description of the system above,~~ a card board folder can be provided to hide the text of the ballot, which can also be inserted with the text down or in a secluded environment.

7.2. Dedicated versus non-dedicated hardware

Most ~~vendors~~economic operators employ dedicated hardware in their solution, although in combination with commodity hardware for e.g. optical scanners, touch screens etc. The hardware encased in the ballot generator machines is mostly industrial standard components. The dedicated ballot generator machines have an average life span of 15-20 years according to the ~~vendors~~economic operators. The main argument of these ~~vendors~~economic operators for employing dedicated hardware is *security*, claiming that dedicated hardware offers better security against visual and electronic eavesdropping, and better logical protection. Also simplified installation, deployment and maintenance are cited by the economic operators as some of the

important benefits of dedicated hardware as opposed to a solution based solely on standard off-the-shelf components.

A couple of the solutions demonstrated to the Ministry ~~are nevertheless~~ were based solely on commodity 'off-the-shelf' hardware ~~instead~~; one of the ~~vendors~~economic operators providing such solutions argued that the trend in their opinion is moving away from procurement of expensive dedicated hardware with what it entails of warehousing, maintenance, and obsolescence issues to software and services. Economic operators that base their solutions on commodity hardware ~~This vendor~~ offers to install their soft~~-~~ware in a wide variety of hardware components, and claim that it is possible to reduce costs further by leasing ~~propose to lease~~ the hardware, arguing that the commodity hardware can be securely wiped after elections and reused for other purposes.

The economic operators have summed up t~~Lessons learned: T~~he advantages and disadvantages of dedicated hardware versus non-dedicated hardware ~~can be summed up~~ as follows during the ~~discussions~~dialogue ~~with the Ministry~~:

	Dedicated hardware	Commodity hardware
Easier to restrict access to parts and internal hardware	✓	
Easier installation and technical assistance	✓	
Easier to use for voter and election officials	✓	
No need for software portability (software only needs to be developed and tested for one type of hardware)	✓	
Replacement of components	✓	✓
Ensure privacy	✓	✓
Less costly		✓
Possibility to reuse HW for other purposes		✓
HW independence		✓

7.3. Voter-verifiable paper audit trail (VVPAT)[11]

~~The six EVM~~ All solutions presented by the ~~vendors~~economic operators at the technical dialogue ~~all~~ provide some sort of paper trail in accordance with the framework set out in the information note. Most solutions were presented as "ballot generators", as it was the understanding of most ~~the vendors~~economic operators that the Danish authorities preferred a solution that generated an actual paper ballot that would not be counted in the EVM, but should be inserted in a ballot box with the option of optical scanning for rapid recording of the vote ~~(by adding a 2D bar code or OCR imprint of the vote)~~. ~~Such solutions would in the opinion of the Ministry generally satisfy the~~ The optical ballot scanning solution presented by one of the ~~vendors~~economic operators ~~would~~ also ~~in the view of the Ministry provide most of the benefits intended by seeking a solution that~~ involves ~~some~~ a paper ballot~~print of the vote~~, as it relies on a traditional hand filled ballot ~~is still employed in this solution~~.

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Kommentar [man26]: Beskrivelsen i note 11 er for detalieret og for teknisk. Foreslås slettet eller omformuleret.

7.4. Security and safeguarding

~~The question of ensuring security against malfunction and internal as well as external attacks was one of the primary focus points of the discussions during the technical dialogue. Not surprisingly, a~~All ~~vendors~~economic operators presented ~~have~~ a great range of different technological and procedural safeguards in place to mitigate these risks.

Among the safeguards mentioned were the following, which do not necessarily apply to all solutions, but are useful to keep in mind when considering the requirements for a future Danish e-voting solution:

- Strong **layer-upon-layer cryptography** applied to ballots, software, etc.
- Production of **zero tallies** before the polling commences to prove that the ballot box is empty – the zero tally can be designed in such a way that it will automatically erase anything in the memory component if something should accidentally or deliberately be stored there,
- Possibility to employ **time locks** to ensure that the system can only be activated at a fixed time, e.g. during the poll,
- System **integrity, availability and authenticity tests**,
- **Ballots are not stored electronically on the EVMs**,
- Ballots are **decrypted by a quorum** after the polls are closed, and the decryption keys are created only by the quorum after the election,
- Systems (e.g. holograms etc.) **prevent ballots from being copied, submitted, and/or counted multiple times,**
- Security against **electromagnetic eavesdropping,**
- **Tampering and malfunction alarms,** which either go off with a loud sound in the voting booth or are communicated more discreetly to the polling supervisor via a headset,
- **Entrances in EVMs are secured** with physical keys and strips/seals,
- **Mathematical proofs** of decryption and counting are run after the elections to make sure that the ballots have not been tampered with and that the system has functioned correctly,
- ~~All hardware is stand alone~~ Hardware is standalone during ~~the~~ polling hours,
- **Ballots are shuffled** before they are decrypted to protect privacy and secrecy of the vote,
- Storage of **images of every ballot,**
- **Cameras** survey data centres,
- **Restriction of access** to core services differentiated according to user identity or user role & requirement of **user authentication,**

Formateret: Skrifttype: Fed

- **Splitting of security keys and passwords** between two or more trusted polling supervisors or members of the election committee, so no official can start or close the system and/or procedure the results alone.

Despite all these and more security provisions, some of the ~~vendors~~economic operators contended that a significant number of threats can and should rather be mitigated by ensuring that the right protocols and procedures are in place. Security should be looked at as involving a combination of people, process and product that all have to work together.

Assessment that an e-voting system functions correctly and that security is maintained is very essential to validate the results of an election and retain the publics' trust in the electoral process.[12] This assessment can be done by the independent evaluation or as ~~mentioned above~~ certification of the system as a whole or of its components, which requires disclosure of the critical system elements. The assessment can be carried out through, for example, disclosure of the system design, inspection of detailed documentation, source code disclosure, inspection of component evaluation and certification reports, in-depth penetration testing, etc. The actual level of disclosure of the system elements needed to achieve appropriate assurance depends on the specific features of the system, its components and the services provided. In this context, one of the questions that need to be addressed is whether the system provided should be "open source".[13]

Audit and certification

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Most economic operators presented a wide range of certificates and credentials achieved from their work with election systems for other customers around the globe.[14] Many of the systems provided by the economic operators that participated in the technical dialogue have been audited by 'the big four' auditing economic operators (PwC, Ernst & Young, Deloitte and KPMG) as well as by academics employed by the customers etc. The economic operators are thus accustomed to having to comply with different standards and undergo different certification and audit procedures and prepared to do so also in a Danish context.

Open source

~~Assessment that an e-voting system functions correctly and that security is maintained is very essential to validate the results of an election and retain the publics' trust in the electoral process.[15] This assessment can be done by the independent evaluation or as mentioned above certification of the system as a whole or of its components, which requires disclosure of the critical system elements. The assessment can be carried out through, for example, disclosure of the system design, inspection of detailed documentation, source code disclosure, inspection of component evaluation and certification reports, in-depth penetration testing, etc. The actual level of disclosure of the system elements needed to achieve appropriate assurance depends on the specific features of the system, its components and the services provided. In this context, one of the questions that need to be addressed is whether the system provided should be "open source".[16]~~

All economic operators declared themselves ready to hand over the system software for independent review, while retaining property of the solution. ~~Many of the solutions use Linux based operating systems~~. Some economic operators sell the software to the customer to do with it as the customer seems fit, including having other economic operators or in-house capacities develop the software, others provide the software on a license basis. Some of the economic operators will honour a requirement to allow open source disclosure, while all are prepared as a minimum to disclose the source code, processes and procedures to independent review and audits. Other solutions indicated by the economic operators was the model chosen in Norway for the solution procured for the pilots at 10 municipalities for the local elections in November 2011.

Here, the economic operators accepted open source, but on the condition that the Norwegian government does not exploit the source code for commercial use, and that the solution is only allowed to be used in Norway, thus enabling the economic operator to sell the same or a similar solution to other customers in other countries.

Many of the economic operators consulted employ Linux based operating systems etc., which are open source. A couple of economic operators favour and employ proprietary technologies. In the opinion of the economic operators, whether or not an e-voting system is open source is not as determinative as whether it is properly audited before put into use.

Kommentar [man27]: Bør overvejes slettet. Afsnittet bidrager ikke med nye oplysninger og er for detalieret. Kan desuden relateres til konkrete firmaes løsninger.

Kommentar [man28]: Foreslås slettet. For detalieret og bidrager ikke med noget.

7.5. Accessibility for the disabled

All solutions demonstrated to the Ministry during the technical dialogue have different accessibility features that allow one or more specific groups of disabled voters to vote without forfeiting the anonymity of their vote, i.e. by enabling them to vote without assistance by a third party, e.g. a family member or election official. The solutions have all been developed and tested in cooperation with different local associations for the disabled and live up to different national and international standards.

All solutions include a feature for blind and visually impaired that incorporates some kind of audio 'read aloud' functionality. The Ministry discussed with the economic operators ways to ensure that a blind or visually impaired voter would know which way to fold the ballot to fold it correctly, so the human readable text is not shown to anyone else before or during the insertion of the ballot into the ballot urn.

Other functionalities presented allow for the use of sip-and-puff devices, joy sticks, buttons, pedals, head-and-mouth pointers, enlarged fonts on screens, and ~~adding of~~ key boards ~~and audio enabling~~. The solutions that employ smartcards to initiate the ballot generator machine all have the possibility to have information added to the smartcard indicating that the voter is blind/visually impaired or otherwise disabled, thus instructing the ballot generator to either turn off the screen or allow the use of a special feature.

All ~~vendors~~economic operators of ballot generators emphasized that the different disability functionalities as default are added to *all* ballot generator machines, so voters needing these functionalities can choose any voting booth containing the machine instead of being assigned to a particular voting booth, with the exception of the optical scanner solution. Finally, many ~~vendors~~economic operators emphasized that the ballot interface shown on the touch screen or (for the optical scanning solution) on the printed ballot can be added party-logos or pictures of the candidates for easier recognition.

A common fact for all systems for the disabled to take into account according to the economic operators is that voting for the disabled using any of the described functionalities will invariably require more time.

7.6. Economic implications

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7.7. Innovation, agile methodology and possibilities for further development (transferability)

All ~~vendors~~economic operators stated that their systems are continuously being updated and developed and that they employ an agile methodology, including new tech-

nological possibilities as they arise. New versions always leverage market improvements, and there is independent evolution of each component. ~~Some of the vendor~~ economic operators ~~shared~~ some ~~future plans for development of their systems~~.

~~*Training and services*~~

All economic operators offer training and services as part of their solution. Training can be designed to meet the customer's need. Many economic operators provide e-learning tools as a supplement to on-site training. Most economic operators employ a train-the-trainer methodology, as it *inter alia* is viewed as most cost-effective. Some international economic operators usually choose to work with a local partner to provide support and other services. All manuals can as a rule be provided in the customer's local language (i.e. in Danish), and calling centres will be staffed with native speakers.

7.8. Scalability and separation of functionalities

All economic operators ~~concurred~~ informed that their solutions could easily be scaled ~~and cited a number of past experiences where it has been necessary to upscale the solution rapidly~~. The solutions are all built according to a modular approach, which means as previously mentioned that the solutions can be customised in a number of ways to meet the demands of the customer.

The EVM-solutions can be progressively introduced, so that initially the machine only marks the ballot, and the e-counting functionality is added at a later stage when voters have grown comfortable with e-voting. However, one economic operator argued that the ballot counting functionality is the least costly when it comes to an EVM-solution and ~~concurrently~~ one of the most beneficial. The economic operator therefore recommended that the Ministry and municipalities opt for the full end2end solution from the beginning. The voter verification station could also be added at a later stage, but one economic operator argued that this functionality is important to implement in the beginning, where voters most likely will be more sceptical and eager to verify the bar code on their ballot to make sure that the machine has worked as intended.

~~*Implementation*~~

Most economic operators stated a lead time of between 6-18 months from contract signing to election-day. This period will however depend on the scale of the procurement; if the solution is being procured only for a limited pilot of 10-30 polling stations, the implementation time of the system will naturally be shorter than if the solution is being procured for the whole country. Stages to be considered when drawing up the project plan include blue print stage (for definition of inter alia the requirements), voter engagement and information campaign (should be initiated as soon as possible and in good time before the election), adaptation of solution to Danish standards and approving of design, independent review/certification of HW, SW, and procedures, manufacture of machines, tests and mock election(s), sealing, training of election staff and finally roll-out of solution, delivery tests etc. However, all economic operators that the Ministry has met with have vast experience in adapting and customising their solutions to meet the specific needs of the customer, and can also offer some flexibility re. implementation.

~~1.~~8. Conclusion: Choices have to be made

Most ~~vendors~~economic operators ~~-~~can provide customized solutions and employ a modular methodology. ~~The~~ All ~~vendors~~economic operators ~~all~~ operate in several different countries with a large variety of election systems, where the lesson learned and imparted to the Ministry during the technical dialogue is that no two election systems are the same, sometimes not even within the same country (e.g. USA).

Formateret: Flere niveauer + Niveau: 2 + Nummereringstypografi: 1, 2, 3, ... + Begynd med: 1 + Justering: Venstre + Justeret: 0,63 cm + Indrykning: 1,27 cm

Formateret: Indrykning: Venstre: 0 cm, Hængende: 0,75 cm, Flere niveauer + Niveau: 1 + Nummereringstypografi: 1, 2, 3, ... + Begynd med: 1 + Justering: Venstre + Justeret: 0,63 cm + Indrykning: 1,27 cm

Therefore, if Denmark proceeds with the plans to make its own experiences with e-voting, a number of **choices** will have to be made by the politicians, *inter alia*:

A. Should e-voting in Denmark be introduced in the form of a voting machine that marks a ballot paper ~~or VVPAT~~ electronically, or should we opt for an optical ballot scanning ~~Ballot generator or only ballot counting~~and counting device that scans and counts hand-filled ballots?

-
- ~~If the first option of an electronic voting machine that marks the vote electronically is chosen, s~~Should the votes then be recorded on the e-voting machine (DRE), or should they it only be recorded when a paper ballot or similar is introduced into a scanning device?
- Should the solution be based on dedicated hardware or commodity hardware?
- What are the main benefits that the municipalities expect to obtain from an e-voting system, and which kind of solution does best fit these needs taking into account the economical, aspects?
- ~~Should the votes be recorded on the e-voting machine (DRE) or should it only be recorded when a paper ballot or similar is introduced into a scanning device?~~
- Should the voters be offered the opportunity to verify not only the human readable imprint of the vote, but also any electronic record (bar code or similar)?
- Is it an option to use some of the other voting schemes the ~~vendors~~economic operators mentioned (e.g. separate high speed scanning in a central location instead of equipping a ballot box with a scanning device, real-to-real or cut-&-drop instead of printing individual ballots, etc.)?
- What kind of accessibility functionalities should be offered to disabled voters?
- Should there be a requirement that the system has to be open source? And to which extent ~~(cf. the Norwegian approach)~~?
- Is the system primarily being considered for voting on election day at the polling stations, or should it also be able to handle advance voting, and if so should it only be used at fixed locations (town halls etc.) or also in mobile environments (e.g. for advance voting at hospitals, the voter's own home, homes for the elderly etc.)?

[1] KL is the interest group and member authority of Danish municipalities.
[2] http://evalg.teknoprojekt.dk/
[3] http://www.demtech.dk/#
[4] http://ted.europa.eu/udl?uri=TED:NOTICE:201846-2012:TEXT:EN:HTML
[5] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:134:0114:0240:EN:PDF
[6] http://ted.europa.eu/udl?uri=TED:NOTICE:201846-2012:TEXT:EN:HTML
[7] https://www.retsinformation.dk/Forms/R0710.aspx?id=137281
[8] At the general election on 15 September 2011, 34,307 of the 3,579,675 votes cast (0.69 %) were spoiled votes. Of these, 22,815 were blank votes and 11,492 votes were spoiled votes, i.e. invalid for other reasons, the last corresponding to 0.32 % of all the votes that were cast.
[9] Direct-recording electronic (DRE) voting machines record the voting data and ballot images in memory components in the EVM.
[10] ~~Incidentally, T~~the electronic 'double envelope' systems are ~~is~~ similar to the system employed for advance voting today, where the advance ballot until election day is stored in an envelope that is sealed and placed in a new envelope with a covering letter containing inter alia the name and address of the voter. The covering letter and sealed envelope containing the advance vote are separated the day before election day, when the polling supervisors examine the advance votes and decide whether all formalities have been met and the vote qualifies for consideration.

Kommentar [man29]: Ballot generator?
Formateret: Skrifttype: Ikke Fed, Engelsk (USA)
Formateret: Indrykning: Venstre: 0 cm, Linjeafstand: enkelt, Punkttegn + Niveau: 1 + Justeret: 1,9 cm + Indrykning: 2,54 cm
Formateret: Skrifttype: Ikke Fed, Engelsk (USA)
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Formateret: Skrifttype: Ikke Fed, Engelsk (USA)
Formateret: Skrifttype: Ikke Fed, Engelsk (USA)
Formateret: Skrifttype: Ikke Fed, Engelsk (USA)
Kommentar [man30]: Gentagelse.
Formateret: Indrykning: Venstre: 0 cm, Linjeafstand: enkelt, Punkttegn + Niveau: 1 + Justeret: 1,9 cm + Indrykning: 2,54 cm
Formateret: Skrifttype: Ikke Fed, Engelsk (USA)
Kommentar [man31]: Bør man ikke starte med det?

Feltkode ændret
Feltkode ændret
Feltkode ændret
Feltkode ændret
Feltkode ændret
Feltkode ændret
Formateret: Slutnotetekst
Formateret: Slutnotehenvisning, Engelsk (USA), Ikke Hævet skrift/ Sænket skrift
Formateret: Ikke Hævet skrift/ Sænket skrift
Formateret: Engelsk (Storbritannien), Ikke Hævet skrift/ Sænket skrift
Formateret: Ikke Hævet skrift/ Sænket skrift
Formateret: Engelsk (Storbritannien), Ikke Hævet skrift/ Sænket skrift
Formateret: Ikke Hævet skrift/ Sænket skrift
Formateret: Engelsk (Storbritannien), Ikke Hævet skrift/ Sænket skrift
Formateret: Ikke Hævet skrift/ Sænket skrift
Formateret: Engelsk (USA)
Formateret: Engelsk (Storbritannien)

[11] A voter-verified paper audit trail (VVPAT) or verified paper record (VPR) is a method of providing feedback to voters using an electronic voting system. A paper VVPAT is by definition readable by the human eye, and offers the voters the opportunity to directly interpret their vote. The VVPAT may be added a bar code or other electronic readable feature for rapid electronic recording of the votes by scanners etc. A VVPAT allows voters the possibility to verify that their votes are cast as intended and can serve as an additional barrier to changing or destroying votes. It is intended, and some argue necessary, as a means by which to detect fraud and equipment malfunction. VVPAT is hence meant to counter fears that an insecure voting machine record could potentially be changed quickly without detection by the voting machine itself, or that corrupt or malfunctioning voting machines might store votes other than as intended by the voter unnoticed. With VVPAT, it is be more difficult for voting machines to corrupt records without human intervention.

[12] According to the Council of Europe's "Legal, operation and technical standards for e-voting", standard no. 24, the components of an e-voting system should always be disclosed, at least to the competent electoral authorities, for verification and certification purposes.

[13] Open source is a philosophy, or pragmatic methodology in production and development that promotes free redistribution and access to an end product's design and implementation details, typically employed for software solutions. There is an international discussion whether such a critical system that touches upon the core of democracy should be validated according to the methodology of open source, the argument for this being that open source entails greater transparency, perceived as the hallmark of democratic elections. For instance, in Norway, which conducted an internet voting pilot in 10 municipalities for its local elections in October 2011, the government chose to make it a condition in the tender that the source code of the e-voting system should be open and accessible to anyone who wished to download and examine it. The solution was, however, not entirely "open source" in the strict sense, as it did not imply the freedom for anyone to change and use the software as they see fit. While anyone anywhere in the world can download and examine the source code, the economic operator has set as a condition that it may only be used for conducting Norwegian elections. http://www.regjeringen.no/en/dep/krd/prosjekter/e-vote-2011-project/source-code/kildekode.html?id=645241

[14] According to the Council of Europe's Recommendations on legal, operational and technical standards for e-voting (2004) (standards 111-112), an e-voting system should be subjected to a certification process introduced by the public authority responsible for procuring or defining the necessary requirements of an e-voting system. The certification process should allow for any ICT (Information and Communication Technology) component in the chosen e-voting solution to be tested and certified as being in conformity with the technical requirements set up by the same authorities. In addition, end-to-end auditing including recording, providing monitoring facilities and providing verification facilities should also be undertaken (standards no. 100-110). See Recommendation Rec(20045)11 of the Council of Europe on legal, operation and technical standards for e-voting. Available at: http://www.coe.int/t/dgap/democracy/activities/GGIS/E-voting/Key_Documents/Rec(2004)11_Eng_Evoting_and_Expl_Memo_en.pdf

~~[15] According to the Council of Europe's "Legal, operation and technical standards for e-voting", standard no. 24, the components of an e-voting system should always be disclosed, at least to the competent electoral authorities, for verification and certification purposes.~~

~~[16] Open source is a philosophy, or pragmatic methodology in production and development that promotes free redistribution and access to an end product's design and implementation details, typically employed for software solutions. There is an international discussion whether such a critical system that touches upon the core of democracy should be validated according to the methodology of open source, the argument for this being that open source entails greater transparency, perceived as the hallmark of democratic elections. For instance, in Norway, which conducted an internet voting pilot in 10 municipalities for its local elections in October 2011, the government chose to make it a condition in the tender that the source code of the e-voting system should be open and accessible to anyone who wished to download and examine it. The solution was, however, not entirely "open source" in the strict sense, as it did not imply the freedom for anyone to change and use the software as they see fit. While anyone anywhere in the world can download and examine the source code, the economic operator has set as a condition that it may only be used for conducting Norwegian elections. http://www.regjeringen.no/en/dep/krd/prosjekter/e-vote-2011-project/source-code/kildekode.html?id=645241~~

Formateret: Engelsk (USA)

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Formateret: Engelsk (USA)

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Formateret: Engelsk (USA)

SJ20130213142014204

Dokumentresumé:

Bestilt af : DEPCLH den 13-02-2013 15:20:13
Dokumentnr.: 5107
Titel: E-valg status 060912 - til minister
Dokumenttype: N
Dokumentdato: 07-09-2012
Kontor/enhed: VALG-ENH, Valgenheden
Sagsmedarb.: Nicoline Nyholm Miller, DEPNNM
Indblik:
Versionsnr.: 1
Reg.dato: 10-09-2012
Registreret af: DEPNNM - Nicoline Nyholm Miller

Emneord:

Tekst:

Modtagere:

Oplysninger:

Datoer:

Erindringer:

Status for e-valg: Resultatet af den tekniske dialog

Før sommerferien afholdt ØIM et heldagsseminar med deltagelse af kommuner og en række it-eksperter, hvor sidstnævnte rejste en række kritiske spørgsmål om bl.a. sikkerhed, økonomi og formål i forbindelse med e-valg. I forlængelse heraf iværksatte ØIM en høring af forsøgskommunerne, hvor forsøgskommunerne skulle give en mere endelig tilbagemelding på, om kommunerne fortsat var interesserede i E-valgsprojektet og var villige til at afsætte de fornødne økonomiske og administrative ressourcer hertil. Fristen er 1. oktober. ØIM har endvidere i 2. halvdel af august – bl.a. i lyset af det nævnte seminar - afholdt en teknisk dialog med 7 primært udenlandske firmaer for at teste markedet for teknisk og økonomisk egnede løsninger. Resultatet af den tekniske dialog er blevet en rapport, affærdiget på engelsk, der, i overensstemmelse med EU's udbudsregler, indeholder en gennemgang af resultatet af den tekniske dialog. Denne rapport vil ØIM sende ud til kommunerne til brug for den verserende høring af kommunalbestyrelserne.

Den tekniske dialog har vist, at markedet er aktivt med seriøse firmaer, der har givet forskellige bud på opgaven og den økonomi, der er forbundet hermed. Et fælles træk har været en høj grad af sikkerhed og centralt fastsatte procedurer også for kommunernes tilrettelæggelse af valghandlingen. De fleste løsninger opererer med en eller anden form for token, vælgeren får udleveret ved afmærkningen på valglisten, og som vælgeren bruger til at aktivere en stemmemaskine i afstemningslokalet. Vælgeren afgiver stemme ved at markere sit valg med fingrene på en trykfølsom skærm, hvorefter maskinen printer en "stemmeseddel" med oplysning om, hvilket parti og/eller hvilken kandidat vælgeren har stemt på, både i maskinlæsbar form og menneskelig læsbar form. Denne "stemmeseddel" bliver herefter maskinelt aflæst i forbindelse med nedlægning i stemmeurnen med henblik på, at det maskinelt aflæste resultat for afstemningsstedet kan udprintes kort tid efter valghandlingens slutning og indrapporteres efter de procedurer, vi kender i dag. De forskellige firmaer har givet forskellige (forsigtige) bud på økonomien, og understreget at denne påvirkes af en række variabler.

Én løsning adskiller sig fra de andre derved, at selve stemmeafgivningen fortsat foregår manuelt for ikke-handicappede vælgere, dvs. at vælgeren manuelt afmærker papirstemmesedlen som hidtil, men efterfølgende indlæser sin stemmeseddel i en optisk scanner placeret oven på en stemmekasse, og som fremfører stemmesedlen mekanisk i stemmekassen, når vælgeren via en trykfølsom skærm monteret ved siden af scanneren har bekræftet, at vælgeren ønsker at afgive den pågældende stemme, som maskinen har registreret og fremvist på skærmen. Forinden kan maskinen via skærmen advare vælgeren, hvis stemmesedlen er afmærket på en sådan måde, at den er ugyldig, og vælgeren kan så vælge at få udleveret en ny stemmeseddel eller godkende den pågældende stemmeseddel vel vidende, at den vil være ugyldig. Optællingen/sorteringen sker maskinelt. Denne løsning er billigere end de andre og løser de fleste af de sikkerhedsproblemer, der er knyttet til en stemmemaskine samtidig med, at den i lighed med en regulær stemmemaskine både kan tilbyde en hurtigere og mere nøjagtig stemmeoptælling, minimerer problemet med de utilsigtede ugyldige stemmer og indeholder løsninger, der gør handicappede i stand til at stemme uden assistance. Løsningen vil formentlig endvidere være hurtigere at implementere. Kommunerne vil blive bl.a. blive spurgt om, hvordan de forholder sig til en sådan løsning.

SJ20130213141942585

Dokumentresumé:

Bestilt af : DEPCLH den 13-02-2013 15:19:42
Dokumentnr.: 5352
Titel: Basic assumptions for calculation of rough total
Dokumenttype: N
Dokumentdato: 11-09-2012
Kontor/enhed: VALG-ENH, Valgenheden
Sagsmedarb.: Nicoline Nyholm Miller, DEPNNM
Indblik:
Versionsnr.: 1
Reg.dato: 11-09-2012
Registreret af: DEPNNM - Nicoline Nyholm Miller

Emneord:

Tekst:

Modtagere:

Oplysninger:

Datoer:

Erindringer:

Dear [economic operator],

Thank you again for your participation in the technical dialogue at the Ministry of Economic Affairs and the Interior on [date] re. an e-voting solution for statutory elections in Denmark.

One of the issues discussed during the technical dialogue was the matter of the economic implications of e-voting, including the costs of conducting an e-voting pilot project, as the municipalities require information on this aspect in order to make a decision on whether they are willing to commit themselves to a future pilot project for a statutory election.

After going over the information imparted by the economic operators on this issue, the Ministry finds that it is necessary to acquire additional information in order to be able to properly appraise the price range for implementing e-voting solutions, as the data received so far during the technical dialogue is very difficult to process into numbers that will give an indication hereof to the municipalities.

You are therefore kindly asked to provide additional information before **Friday morning 13 September 2012 at 8:00 a.m.** stating a rough estimate of a total price for your solution for two different scenarios based on the following assumptions:

- **An estimation of the total price for three polling stations of varying sizes (see below) for 1 election in a municipality with respectively:**
    a. **20,000 voters**
    b. **50,000 voters**
    c. **200,000 voters**
    - Based on a 10 year contract (7 elections) for the whole country (4 mill. voters)
        1. Price for small polling station of 1,500 voters
        2. Price for a medium sized polling station of 5,000 voters
        3. Price for a large polling station of 10,000 voters
- **An estimation of the price for a pilot project in a municipality**
    - Based on the participation of 10 municipalities with 2 polling stations each; one of 5,000 voters and one of 1,500 voters

Price should include (if applicable according to the solution demonstrated):

- **Hardware**, including: voting cards activation, voting ballot generators, optical ballot scanner, smart ballot boxes, machine for initialization of tokens, voter verification functionality, printers for polling reports, UPS, etc. – assuming the hardware is purchased and not licenced
- **Tokens** for initialization of ballot generator

- **Software** for voting ballot generators, ballot boxes, smartcard readers, election management and interfaces
- **Paper rolls** for ballots (if used)
- **Services and logistics**, including central configuration and testing of equipment, delivery to polling stations, deployment, configuration and test of hard- and software at polling stations before election day, dismounting after elections and storage between elections, maintenance of equipment, change and repair of equipment in case of malfunction
- **Support** before and during election day in call centre and in polling stations
- **Training** of election officials and municipal IT-workers in deployment of election hardware

We understand that this estimate would only be tentative, probably will be calculated on the basis of solutions delivered for other comparable customers and does not preclude the actual pricing in the event of a tender process for the procurement of a system for e-voting in Denmark.

Also, we would like to ask if you have any objections to the inclusion in the report (in depersonalized form) of the information re. the economic implications imparted during the technical dialogue, among these some of the price examples stated. We will not be stating specific prices, but are considering whether we could indicate a price range for some of the hardware components in particular and the software to the extent possible.

I apologize for the tight deadline. Please do not hesitate to contact me if you have any questions to this inquiry. Thank you very much for your cooperation, which is much appreciated.

SJ20130213141941380

Dokumentresumé:

Bestilt af : DEPCLH den 13-02-2013 15:19:40
Dokumentnr.: 5387
Titel: E-valgsrapport - HASTER - spørgsmål om beskrivelse af økonomien til Kammeradvokaten
Dokumenttype: U
Dokumentdato: 11-09-2012
Kontor/enhed: VALG-ENH, Valgenheden
Sagsmedarb.: Nicoline Nyholm Miller, DEPNNM
Indblik:
Versionsnr.: 1
Reg.dato: 11-09-2012
Registreret af: DEPNNM - Nicoline Nyholm Miller

Emneord:

Tekst:

Modtagere:
Modtager Kammeradvokaten , Vester Farigmagsgade 23

Oplysninger:

Datoer:

Erindringer:

Christina Løtzsch Hansen

Fra: Christian Vigh
Sendt: 11. september 2012 14:06
Til: mas@kammeradvokaten.dk
Cc: Nicoline Nyholm Miller; Hans B. Thomsen
Emne: E-valgsrapport - HASTER

Kære Marianne
Jeg kan forstå på Nicoline, at kammeradvokaten ikke mener, at vi kan formulere afsnittet i rapporten om økonomien i E-valg sådan som vi har gjort i vores udkast, som er fremsendt til jer for kommentarer, idet vi risikerer at give fortrolige informationer om de enkelte leverandører ved at dele prisen op på de forskellige enheder, og idet det i øvrigt også er for upræcise angivelser. Som jeg har forstået det, er jeres råd at vi genåbner den tekniske dialog, idet vi kontakter samtlige 7 deltager i den tekniske dialog og anmoder hver enkelt om at præcisere oplysningerne om økonomien sådan, at vi får et mere præcist estimat for den samlede pris for gennemførelsen af et E-valg under nogle nærmere angivne forudsætninger.

Problemet er, at vi har skrevet afsnittet ud fra de oplysninger vi har fået på møderne (hvor leverandørerne i øvrigt ikke gav udtryk for at de økonomiske oplysninger var fortrolige vel vidende at vi ville skrive dem i en offentligt tilgængelig rapport). Vi har jo lænet os op ad jeres rådgivning hele vejen igennem, både ved udarbejdelsen af det skriftlige materiale der har ligget til grund for dialogen og ved jeres aktive deltagelse i alle dialogerne. Derfor er jeg nødt til at sige, at jeg synes det er uheldigt, at vi først på nuværende tidspunkt får det råd, at vi burde have grebet spørgsmålet om økonomien anderledes an – og ikke før eller under dialogerne. Det er ikke særlig hensigtsmæssigt i forhold til tidsplanen og ressourceanvendelsen i øvrigt.

Vi er under et stærkt tidspres, også i f.t. ministeren – og derfor har vi besluttet, at vi foreløbig tager økonomiafsnittet ud i den pakke der bliver lagt op til ministeren og sendt ud til kommunalbestyrelserne i morgen.

Vores intention er så, at vi eftersender oplysningerne om økonomien i slutningen af ugen.

For at gøre det muligt at indhente oplysningerne vil det bedste for os være, at vi i dag sender en enslydende mail til alle 7 deltagere med anmodning om, at de præciserer oplysningerne om økonomien under nogle nærmere angivne forudsætninger mhp. at vi kan give et samlet estimat (ikke opdelt på enkeltdele), af både et landsdækkende valg og et mindre forsøg (der er jo en væsentlig forskel) og at de giver os disse oplysninger fredag morgen kl. 8.

Vi har lavet et udkast til mail, jfr. nedenfor.

Vi vil sætte pris på at få jeres bemærkninger hertil – både i forhold til fremgangsmåden og evt. også jeres tekstnære bemærkninger til mailen så hurtigt det kan lade sig gøre. Hvis I mener der er behov for et hurtigt møde kan vi selvfølgelig også arrangere det.

Du må gerne bekræfte at du har fået mailen.

Mvh Christian

Med venlig hilsen

Christian Vigh
Kontorchef, Kommunaljura
Direkte tlf. 7228 2520 / mobil 25 23 92 65
Mail: chv@oim.dk

økonomi og indenrigsministeriet

Slotsholmsgade 10-12
1216 København K
Telefon 72 28 24 00

Fax 72 28 24 01
www.oim.dk

Dear [economic operator]
Thank you again for your participation in the technical dialogue at the Ministry of Economic Affairs and the Interior on [date] on an e-voting solution for statutory elections in Denmark.
One of the issues discussed during the technical dialogue was the matter of the economic implications of e-voting, including the costs of conducting an e-voting pilot project, as the municipalities require information on this aspect in order to make a decision on whether they are willing to commit themselves to a future pilot project for a statutory election.
After going over the information imparted by the economic operators on this issue, the Ministry finds that it is necessary to acquire additional information in order to be able to properly appraise the price range for implementing e-voting solutions, as the data received so far during the technical dialogue is very difficult to process into numbers that will give an indication hereof to the municipalities.
You are therefore kindly asked to provide additional information before ***Friday morning 13 September 2012 at 8:00 a.m.*** *stating a rough estimate of a total price for your solution for two different scenarios based on the following assumptions:*

Basic assumptions for the calculation of rough total for procurement of e-voting system

1. ***An estimation of the total price for 1 election***

   - *Based on a 10 year contract (7 elections) for 4 mill. voters*

   A. *Price for small polling station of 1,500 voters*

   B. *Price for a medium sized polling station of 5,000 voters*

   C. *Price for a large polling station of 10,000 voters*

2. ***An estimation of the price for a pilot project***

   - *Based on the participation of 10 municipalities with 2 polling stations each; one of 5,000 voters and one of 1,500 voters*

Price should include (if applicable according to the solution demonstrated):

- ***Hardware****, including: voting cards activation, voting ballot generators, optical ballot scanner, smart ballot boxes, machine for initialization of tokens, voter verification functionality, printers for polling reports, UPS, etc. – assuming the hardware is purchased and not licenced*
- ***Tokens*** *for initialization of ballot generator*
- ***Software*** *for voting ballot generators, ballot boxes, smartcard readers, election management and interfaces*
- ***Paper rolls*** *for ballots (if used)*
- ***Services and logistics****, including central configuration and testing of equipment, delivery to polling stations, deployment, configuration and test of hard- and software at polling stations before election day, dismounting after elections and storage between elections, maintenance of equipment, change and repair of equipment in case of malfunction*
- ***Support*** *before and during election day in call centre and in polling stations*
- ***Training*** *of election officials and municipal IT-workers in deployment of election hardware*

We understand that this estimate would only be tentative, probably will be calculated on the basis of solutions delivered for other comparable customers and does not preclude the final pricing in the event of a tender process for the procurement of a system for e-voting in Denmark.
Thank you very much for your cooperation, which is much appreciated.

SJ20130213141940118

Dokumentresumé:

Bestilt af : DEPCLH den 13-02-2013 15:19:39
Dokumentnr.: 5396
Titel: Svar fra Kammeradvokaten på spørgsmål om økonomi
Dokumenttype: I
Dokumentdato: 11-09-2012
Kontor/enhed: VALG-ENH, Valgenheden
Sagsmedarb.: Nicoline Nyholm Miller, DEPNNM
Indblik:
Versionsnr.: 1
Reg.dato: 11-09-2012
Registreret af: DEPNNM - Nicoline Nyholm Miller

Emneord:

Tekst:

Modtagere:
Afsender Kammeradvokaten , Vester Farigmagsgade 23

Oplysninger:

Datoer:

Erindringer:

Christina Løtzsch Hansen

Fra: Marianne Søgaard <mas@kammeradvokaten.dk>
Sendt: 11. september 2012 15:07
Til: Christian Vigh
Cc: Nicoline Nyholm Miller; Hans B. Thomsen; Milena Anguelova Krogsgaard
Emne: SV: E-valgsrapport - HASTER

Kære Christian

Tak for din mail.

Milena modtog først i dag økonomiafsnittet, og efter at jeg nu har talt med Milena, kan jeg oplyse, at det var hendes opfattelse, at oplysningerne på møderne kunne anvendes til skønsmæssige beregninger til brug for en generel prisramme til rapporten med de usikkerhedsmomenter, der blev anført på møderne. Jeg er ikke bekendt med, hvordan Århus Kommune har anvendt tallene eller har ment, at de skulle kunne anvendes, herunder hvor præcise tal, Århus Kommune mente, at man havde brug for. Det er naturligvis beklageligt, hvis der ikke har været den nødvendige forventningsafstemning om, hvordan I ønskede beregningerne af økonomien foretaget.

Mht. spørgsmålet om aktindsigt, så undrer din tilkendegivelse mig lidt, eftersom det på møderne oplyses, at fortrolige oplysninger ikke vil blive gengivet i rapporterne. Priselementer plejer at være fortrolige oplysninger. Jeg har i dag sagt til Nicoline, at jeg mener, at et alternativ er, at man hører tilbudsgiverne om, hvorvidt de gengivne priselementer er fortrolige. Jeg kan jo ikke svare på, om der findes prislisteoplysninger mv. på deres hjemmesider, som gør, at I med sindsro kan videregive de pågældende oplysninger i den valgte form.

Når jeg i dag rådgav Nicoline, som jeg gjorde, var det ud fra en vurdering af, at afsnittet ikke nødvendigvis bidrog til det store klare økonomiske overblik, og jeg syntes derfor, at genåbningen af dialogen var en bedre vej. Alternativet er naturligvis, at I hører tilbudsgiverne om, hvorvidt i må offentliggøre deres priselementer, som oplyst på møderne.

Et andet alternativ er, at man kigger på tallene igen og forsøger sig med generelle beregninger i stedet for de meget konkret beregninger.

Jeg vil meget gerne tage en drøftelse med dig om, hvad du mener, vi skulle have oplyst tidligere.

Jeg er på vej ind i et møde, men Milena kigger på jeres udkast til mail til tilbudsgiverne, og du får således en tilbagemelding herom snarest.

Mit møde varer formentlig frem til kl 19, men jeg ringer dig gerne op efter dette tidspunkt. Send mig en mail om, hvad du ønsker.

Med venlig hilsen

Marianne Søgaard
Partner, Advokat (L)

Direkte +45 72 30 73 29 ⋮ mas@kammeradvokaten.dk
Mobil +45 20 69 52 53 ⋮ www.kammeradvokaten.dk

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Kammeradvokaten
Advokatfirmaet Poul Schmith

Fra: Christian Vigh [mailto:chv@oim.dk]
Sendt: 11. september 2012 14:06
Til: Marianne Søgaard
Cc: Nicoline Nyholm Miller; Hans B. Thomsen
Emne: E-valgsrapport - HASTER

Kære Marianne

Jeg kan forstå på Nicoline, at kammeradvokaten ikke mener, at vi kan formulere afsnittet i rapporten om økonomien i E-valg sådan som vi har gjort i vores udkast, som er fremsendt til jer for kommentarer, idet vi risikerer at give fortrolige informationer om de enkelte leverandører ved at dele prisen op på de forskellige enheder, og idet det i øvrigt også er for upræcise angivelser. Som jeg har forstået det, er jeres råd at vi genåbner den tekniske dialog, idet vi kontakter samtlige 7 deltager i den tekniske dialog og anmoder hver enkelt om at præcisere oplysningerne om økonomien sådan, at vi får et mere præcist estimat for den samlede pris for gennemførelsen af et E-valg under nogle nærmere angivne forudsætninger.

Problemet er, at vi har skrevet afsnittet ud fra de oplysninger vi har fået på møderne (hvor leverandørerne i øvrigt ikke gav udtryk for at de økonomiske oplysninger var fortrolige vel vidende at vi ville skrive dem i en offentligt tilgængelig rapport). Vi har jo lænet os op ad jeres rådgivning hele vejen igennem, både ved udarbejdelsen af det skriftlige materiale der har ligget til grund for dialogen og ved jeres aktive deltagelse i alle dialogerne. Derfor er jeg nødt til at sige, at jeg synes det er uheldigt, at vi først på nuværende tidspunkt får det råd, at vi burde have grebet spørgsmålet om økonomien anderledes an – og ikke før eller under dialogerne. Det er ikke særlig hensigtsmæssigt i forhold til tidsplanen og ressourceanvendelsen i øvrigt.

Vi er under et stærkt tidspres, også i f.t. ministeren – og derfor har vi besluttet, at vi foreløbig tager økonomiafsnittet ud i den pakke der bliver lagt op til ministeren og sendt ud til kommunalbestyrelserne i morgen.

Vores intention er så, at vi eftersender oplysningerne om økonomien i slutningen af ugen.

For at gøre det muligt at indhente oplysningerne vil det bedste for os være, at vi i dag sender en enslydende mail til alle 7 deltagere med anmodning om, at de præciserer oplysningerne om økonomien under nogle nærmere angivne forudsætninger mhp. at vi kan give et samlet estimat (ikke opdelt på enkeltdele), af både et landsdækkende valg og et mindre forsøg (der er jo en væsentlig forskel) og at de giver os disse oplysninger fredag morgen kl. 8.

Vi har lavet et udkast til mail, jfr. nedenfor.

Vi vil sætte pris på at få jeres bemærkninger hertil – både i forhold til fremgangsmåden og evt. også jeres tekstnære bemærkninger til mailen så hurtigt det kan lade sig gøre. Hvis I mener der er behov for et hurtigt møde kan vi selvfølgelig også arrangere det.

Du må gerne bekræfte at du har fået mailen.

Mvh Christian

Med venlig hilsen

Christian Vigh
Kontorchef, Kommunaljura
Direkte tlf. 7228 2520 / mobil 25 23 92 65
Mail: chv@oim.dk

økonomi og indenrigsministeriet

Slotsholmsgade 10-12
1216 København K
Telefon 72 28 24 00
Fax 72 28 24 01
www.oim.dk

Dear [economic operator]
Thank you again for your participation in the technical dialogue at the Ministry of Economic Affairs and the Interior on [date] on an e-voting solution for statutory elections in Denmark.
One of the issues discussed during the technical dialogue was the matter of the economic implications of e-voting, including the costs of conducting an e-voting pilot project, as the municipalities require information on this aspect in order to make a decision on whether they are willing to commit themselves to a future pilot project for a statutory election.

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Thank you very much for your cooperation, which is much appreciated.

SJ20130213141559496

Dokumentresumé:

Bestilt af : DEPCLH den 13-02-2013 15:15:58
Dokumentnr.: 5565
Titel: PWCs bemærkninger til rapport om teknisk dialog
Dokumenttype: I
Dokumentdato: 07-09-2012
Kontor/enhed: VALG-ENH, Valgenheden
Sagsmedarb.: Nicoline Nyholm Miller, DEPNNM
Indblik:
Versionsnr.: 1
Reg.dato: 12-09-2012
Registreret af: DEPNNM - Nicoline Nyholm Miller

Emneord:

Tekst:

Modtagere:
Afsender Mikael Buchholtz (MBZ@pwc.dk) ,

Oplysninger:

Datoer:

Erindringer:

Christina Løtzsch Hansen

Fra: Mikael Buchholtz <MBZ@pwc.dk>
Sendt: 7. september 2012 16:05
Til: Nicoline Nyholm Miller
Emne: Re: E-valg - sikkerhedsforanstaltninger

Hej Nicoline

Jeg kan godt forstå at du ikke vil beskrive sikkerhedsdetaljerne i de enkelte systemer. Vi har kun sporadisk krasset lidt i overfladen om hvordan de forskellige sikkerhedsløsninger fungere. Så jeg synes at det er fint at den indledende sætning er passende vag.

Cameras survey data centres,
Jeg ville slette denne linje. Dels taler vi om en løsning, der primært vil være opstillet lokalt på valgstederne og datacentre er derfor ikke relevante. Dels er der en helt masse andre ting omkring sikkerhed i data centre man kunne nævne hvis vi begynder på det.

Mathematical proofs of decryption and counting are run after the elections to make sure that the ballots have not been tampered with and that the system has functioned correctly,
Jeg forstår ikke rigtig hvad du mener her :)
Enten kunne du mene noget med at stemmerne er krypterede og dekryptering derved vil afsløre om der er nogen der har manipuleret stemmen. Kryptografi baseres sig i sig selv på matematiske beviser - sådan da... (og teknisk set ville man ikke bruge kryptering/dekryptering, men kryptografisk signering og verifikation til at checke integritet, men jeg husker at et par af leverandørene ikke synes at den detalje var værd at have forstået :)
Eller også kunne du mene noget med at statistiske beregninger kunne vise at valget (sandsynligvis) var foregået rigtigt

Ellers tænkte jeg lige på at man kunne skrive et punkt om:

Implement procedures to prepare equipment for the election, so ensure that the systems have not been manipulated and will function according the original security specifications.

I sidste ende afhænger de sikkerhedskrav vi i sidste ende stiller meget af hvor specifikt vi kravstiller det system, der skal indkøbes. Jo mere præcist vi beskriver systemet jo mere præcist kan vi beskrive sikkerhedskravene. Så jeg kan ikke lige give en udtømmende lister her fredag eftermiddag.

Jeg ved ikke om du også vil skrive en konklusion i stil med: "Det er vores foreløbige opfattelse at der i markedet findes leverandører, der kan levere en tilstrækkelig sikker e-valgsløsning. Sikkerheden i den endelige løsning er dog stærk afhængig af at sikkerhed bliver nøje overvejet i alle faser der leder frem til et elektronisk valg. Sikkerhed vil således være en central del af kravstillelse, implementering, test, certificering, udarbejdelse af procedurer, afholdelse af valget mv."

Jeg er i øvrigt på kursus i første del af næste uge og har kun sporadisk adgang til e-mail i denne periode. Hvis du har brug for assistance i den periode, så kan du kontakte Jess eller Martin.

God weekend,

Mikael Buchholtz
PwC | Manager - PhD, MScEng, ESL
Consulting
D: +45 3945 3544 | M: +45 2460 6330
Email: mbz@pwc.dk | www.pwc.dk
Strandvejen 44, DK-2900 Hellerup

From: Nicoline Nyholm Miller <nnm@oim.dk>
To: "Mikael Buchholtz (MBZ@pwc.dk)" <MBZ@pwc.dk>
Date: 07-09-2012 14:39
Subject: E-valg - sikkerhedsforanstaltninger

Kære Mikael
Jeg har opgivet en mere indgående beskrivelse af de forskellige sikkerhedsforanstaltninger præsenteret i de forskellige løsninger og går mere efter en opremsning. Jeg har foreløbig nævnt følgende – vil du øje dem igennem og melde tilbage, om der er nogle vigtige nogen, jeg har glemt? Tak! Og god weekend, når du når så langt. Regner med at sende en ny version af rapporten om et par timer eller tre.

Mange hilsener,
Nicoline

"Among the safeguards mentioned were the following, which do not necessarily apply to all solutions, but are useful to keep in mind when considering the requirements for a future Danish e-voting solution:

- Strong **layer-upon-layer cryptography** applied to ballots, software, etc.
- Production of **zero tallies** before the polling commences to prove that the ballot box is empty – the zero tally can be designed in such a way that it will automatically erase anything in the memory component if something should accidentally or deliberately be stored there,
- Possibility to employ **time locks** to ensure that the system can only be activated at a fixed time, e.g. during the poll,
- System **integrity, availability and authenticity tests**,
- **Ballots are not stored electronically on the EVMs**,
- Ballots are **decrypted by a quorum** after the polls are closed, and the decryption keys are created only by the quorum after the election,
- Systems (e.g. holograms etc.) **prevent ballots from being copied, submitted, and/or counted multiple times,**
- Security against **electromagnetic eavesdropping,**
- **Tampering and malfunction alarms,** which either go off with a loud sound in the voting booth or are communicated more discreetly to the polling supervisor via a headset,
- **Entrances in EVMs are secured** with physical keys and strips/seals,
- **Mathematical proofs** of decryption and counting are run after the elections to make sure that the ballots have not been tampered with and that the system has functioned correctly,
- All **hardware is stand alone** during the polling hours,
- **Ballots are shuffled** before they are decrypted to protect privacy and secrecy of the vote,
- Storage of **images of every ballot,**
- **Cameras** survey data centres,
- **Restriction of access** to core services differentiated according to user identity or user role & requirement of **user authentication,**
- **Splitting of security keys and passwords** between two or more trusted polling

supervisors or members of the election committee, so no official can start or close the system and/or procedure the results alone."

Valgkonsulent, Kommunaljura
Nicoline Nyholm Miller

økonomi og
indenrigsministeriet

Slotsholmsgade 10-12
1216 København K
Telefon 72 28 25 22
Fax 72 28 24 01
valg.im.dk

SJ20130213141548122

Dokumentresumé:

Bestilt af : DEPCLH den 13-02-2013 15:15:47
Dokumentnr.: 5573
Titel: KLs bemærkninger til udkast til rapport og overslag om økonomi for e-valg
Dokumenttype: I
Dokumentdato: 12-09-2012
Kontor/enhed: VALG-ENH, Valgenheden
Sagsmedarb.: Nicoline Nyholm Miller, DEPNNM
Indblik:
Versionsnr.: 1
Reg.dato: 13-09-2012
Registreret af: DEPNNM - Nicoline Nyholm Miller

Emneord:

Tekst:

Modtagere:
Afsender KL , Weidekampsgade 10

Oplysninger:

Datoer:

Erindringer:

Christina Løtzsch Hansen

Fra: Jacob Poulsby Andersen <JAS@kl.dk>
Sendt: 12. september 2012 21:34
Til: 'Jesper Eltved'; Nicoline Nyholm Miller; Lene Hartig Danielsen; Mette Marie Sundbøll; 'JOBN@Odense.dk'
Cc: Milena Anguelova Krogsgaard; Jakob Asmussen
Emne: SV: Udkast til rapport og overslag om økonomi for e-valg

Hej Jesper

Tak for det tilsendte.

Du har opgivet posterne:

- Stemmemaskiner
- Valgurner
- Øvrig hardware
- Tilretning af stemmebokse
- Smartcards
- Licenser
- Teknisk support på valgdagen
- Uddannelse af valgmedarbejdere
- Projektledelse og implementering
- Information

Jeg er enig i, at det er de primære omkostninger forbundet med de digitale valghandlinger. Super at du har taget en post med, der hedder information. Det kan godt være, at den er lidt for lavt sat, da tryghed omkring dagen er ekstrem vigtig. Skal der sendes noget ud sammen med valgkortet? Skal der hænge skilte ved indgangen til valgstedet – og hvad med bagefter og i stemmeboksene? Der er selvfølgelig noget stordrift i det, da materialet kan bestilles fælles af forsøgskommunerne.

Jeg savner et estimat på omkostninger til:

- Evaluering af den digitale valghandling (timer)
- Backup-systemer til strøm (en generator eller andet?)
- Revision under valghandlingen og indberetning (hvem afholder disse omkostninger)

Derudover; da der er tale om et forsøg, skal der være et beredskab klar til at tage over, hvis der skulle gå noget galt. Smartcards kan ikke indgå i en traditionel valghandling med blyant, det kan de stemmesedler, vi fik vist, hvor borgeren selv scanner og godkender stemmen.

Projektledelse (timer * timepris på en akademisk medarbejder, cirka 500-600 kroner). Jeg synes, at skønnet er meget lavt – jeg gætter på mindst det dobbelt, måske endda tre- eller firedobbelt ressourceforbrug.

Ovenstående er blot forslag. Jeg synes, at det allerede nu er deltaljeret nok til at give et fint skøn, men det er bedre at skrive lidt for meget på end for lidt. Det er nok en god ide af høre Nicoline, om de er enige i overslaget.

Når du har lavet det endelige udkast – med eller uden mine kommentarer – kan du så ikke sende mig en mail eller ringe på 3370 3102. Så samler jeg slides og sender ud til deltagerne på informationsmødet. Det skal meget gerne ske senest i morgen eftermiddag.

Vh
Jacob

Fra: Jesper Eltved [mailto:jel@aarhus.dk]
Sendt: 11. september 2012 13:13
Til: Nicoline Nyholm Miller; Lene Hartig Danielsen; Mette Marie Sundbøll; 'JOBN@Odense.dk'
Cc: Milena Anguelova Krogsgaard; Jacob Poulsby Andersen; Jakob Asmussen
Emne: SV: Udkast til rapport og overslag om økonomi for e-valg

Kære Nicoline

Tak for i går. Det ser rigtig fint ud det, du har skrevet. Umiddelbart synes jeg, du har fået det hele med.

Jeg vedlægger beregninger, jeg har lavet for afstemningssteder af forskellig størrelse. Kommenter endelig. Der kan være fx være udgifter I mener ikke er med i beregningerne. De to filer er ens, det ene er pdf, det andet er power point.

Med venlig hilsen

Jesper Eltved
Specialkonsulent
Tlf.: +45 8940 5015 Mobil +45 2920 8329
E-mail: jel@aarhus.dk

Aarhus Kommune
Kultur og Borgerservice
Borgerservice
Rådhuset
DK-8100 Aarhus C

Fra: Nicoline Nyholm Miller [mailto:nnm@oim.dk]
Sendt: 11. september 2012 10:23
Til: Lene Hartig Danielsen; Jesper Eltved; Mette Marie Sundbøll; 'JOBN@Odense.dk'
Cc: Milena Anguelova Krogsgaard
Emne: Udkast til rapport og overslag om økonomi for e-valg

Tak for i går til alle, det gik jo rigtig godt. Er i fuld gang med at skrive udkast til ministerbrev, der vedlægges rapporten, og gerne skulle nå kommunerne om en dag eller to.

Jeg har alligevel skrevet lidt om de økonomiske konsekvenser, vedhæfter udkast til rapporten her, og håber Jesper måske har tid til at øje dem igennem og se, om han er enig.

Jeg har ikke skrevet noget om omkostninger per valg, ligesom omkostninger til service og vedligeholdelse ikke har været muligt at estimere nærmere – problemet er også, at nogle leverandører har afgivet mere detaljerede oplysninger end (de fleste) andre, og af konkurrencemæssige hensyn har jeg det ikke godt med at oplyse tal, som vi kun har fra én leverandør, f.eks. timesats for videreudvikling af software, men har prøvet at sætte nogle runde tal ind, hvor der var flere bud (eneste undtagelse er scannerløsningen, her har jeg været nødt til at oplyse prisen pr. enhed). Endvidere kan tallene ikke nødvendigvis sammenlignes, da leverandørernes priser på hardware m.v. jo kan hvile på forskellige forudsætninger, så nogle priser måske er mere "realistiske" og tættere på den endelige pris end andre. Håber alligevel kommunerne kan få noget ud af dette. En af leverandørerne estimerede på basis af en kontrakt på 15 år og fuld udrulning i hele landet, at en e-valgsløsning med print af stemmeseddel ville koste i omegnen af 62 millioner per valg – så kan man fratrække nogle af de udgifter, I har i forvejen, men for at have et tal at forholde sig til (til sammenligning koster et valg i dag kommunerne ca. 100 millioner kr. på landsplan). Jeg synes dog ikke vi kan

oplyse dette tal, da vi igen kun har estimatet fra én leverandør, og det i øvrigt ikke siger noget om prisen for et pilotforsøg.

Lad mig høre hurtigt, om I har nogen bemærkninger, da jeg lægger rapporten op i eftermiddag!

Mange hilsener
Nicoline

Fra: Lene Hartig Danielsen [mailto:lha@aarhus.dk]
Sendt: 9. september 2012 16:12
Til: Jacob Poulsby Andersen
Cc: Nicoline Nyholm Miller; Jesper Eltved
Emne:

Kære Jacob

Hermed min præsentation til i morgen. Styregruppeorienteringen tager jeg mundtligt og kort.

Vil du medbringe præsentationen på mødet. Den kan også efterfølgende- måske sammen med andre præsentationer - lægges på dialogforum.

På gensyn.

Jeg tager tog 6.28. og skal retur sammen Jesper med tog retur til Aarhus 15.50.

MVh Lene

Fra: Jacob Poulsby Andersen [mailto:JAS@kl.dk]
Sendt: 7. september 2012 14:59
Til: Lene Hartig Danielsen
Emne: oplæg mandag

Hej Lene

Jeg mangler en bekræftelse fra dig om, at du holder oplæg på informationsmødet i KL på mandag, jf. min tidligere mail til styregruppen?

God weekend, håber du nyder festugen ☺

Vh
Jacob

Konsulent Jacob Poulsby Andersen
Kontor for Digitalisering og Borgerbetjening

Weidekampsgade 10
Postboks 3370
2300 København S.

Tlf.: 3370 3102
E-mail jas@kl.dk

http://www.kl.dk

EAN: 579 000 1724 344

SJ20130213104156 70

Dokumentresumé:

Bestilt af : DEPCLH den 13-02-2013 11:41:55
Dokumentnr.: 5695
Titel: Kommentar fra Kammeradvokaten vedr. økonomiafsnittet i rapport om teknisk dialog
Dokumenttype: I
Dokumentdato: 11-09-2012
Kontor/enhed: VALG-ENH, Valgenheden
Sagsmedarb.: Nicoline Nyholm Miller, DEPNNM
Indblik:
Versionsnr.: 1
Reg.dato: 13-09-2012
Registreret af: DEPNNM - Nicoline Nyholm Miller

Emneord:

Tekst:

Modtagere:
Afsender Kammeradvokaten , Vester Farigmagsgade 23

Oplysninger:

Datoer:

Erindringer:

Christina Løtzsch Hansen

Fra: Milena Anguelova Krogsgaard <man@kammeradvokaten.dk>
Sendt: 11. september 2012 12:00
Til: Nicoline Nyholm Miller
Cc: Marianne Søgaard
Emne: SV: E-valg - rapport teknisk dialog2 [KA-Active.FID252410]

Kære Nicoline,

Jeg har læst økonomiafsnittet og vil anbefale, at I ikke oplyser detailpriser - for enheder eller lignende. Disse vil ofte kunne anses for at være forretningshemmeligheder. Min anbefaling er, at økonomiafsnittet alene indeholder en beløbsramme, og i evt. kan oplyse de priselementer, rammen består af.

Mvh
Milena

Med venlig hilsen

Milena Anguelova Krogsgaard
Advokat (L)

Direkte +45 72 30 74 77 | man@kammeradvokaten.dk
Mobil +45 25 10 05 57 | www.kammeradvokaten.dk

Kammeradvokaten
Advokatfirmaet Poul Schmith

Fra: Nicoline Nyholm Miller [mailto:nnm@oim.dk]
Sendt: 11. september 2012 11:34
Til: Milena Anguelova Krogsgaard
Emne: SV: E-valg - rapport teknisk dialog2

Kære Milena
Tak for dine kommentarer, som er implementeret for den største del – dog har vi valgt at bibeholde noget af detaljeringsgraden trods dine forslag om det modsatte. Du behøver ikke gennemgå rapporten igen, jeg sendte den mest til orientering – med mindre du gerne vil have lejlighed til at se beskrivelsen af økonomien, som er ny i forhold til, hvad du tidligere har set. Jeg lægger rapporten op til ministeren i eftermiddag, men den bliver først sendt ud i morgen eftermiddag eller torsdag, og mindre rettelser kan godt implementeres efter ministerforelæggelse.

Bedste hilsener
Nicoline

Fra: Milena Anguelova Krogsgaard [mailto:man@kammeradvokaten.dk]
Sendt: 11. september 2012 10:51
Til: Nicoline Nyholm Miller
Emne: Re: E-valg - rapport teknisk dialog2

Kære Nicoline,

Jeg sidder i møde. Fik du mine kommentarer i går og er der behov for, at jeggennemgår den igen. I givet fald hvad er fristen.

Mvh

Milena

Sendt fra min iPhone

Den 11/09/2012 kl. 10.40 skrev "Nicoline Nyholm Miller" <nnm@oim.dk>:

> ...nu med vedhæftet fil ☺
>
> Vh Nicoline
> <E-valg - rapport teknisk dialog2.docx>

SJ20130213104154818

Dokumentresumé:

Bestilt af : DEPCLH den 13-02-2013 11:41:54
Dokumentnr.: 5696
Titel: Forslag til afgrænsning af økonomisk afsnit
Dokumenttype: I
Dokumentdato: 11-09-2012
Kontor/enhed: VALG-ENH, Valgenheden
Sagsmedarb.: Nicoline Nyholm Miller, DEPNNM
Indblik:
Versionsnr.: 1
Reg.dato: 13-09-2012
Registreret af: DEPNNM - Nicoline Nyholm Miller

Emneord:

Tekst:

Modtagere:
Modtager Kammeradvokaten , Vester Farigmagsgade 23

Oplysninger:

Datoer:

Erindringer:

Christina Løtzsch Hansen

Fra: Christian Vigh
Sendt: 11. september 2012 15:59
Til: Marianne Søgaard
Cc: Nicoline Nyholm Miller; Hans B. Thomsen; Milena Anguelova Krogsgaard
Emne: SV: E-valgsrapport - HASTER

Kære Marianne
Jeg går ud fra, at vi kan kombinere modellerne, sådan at vi sender den mail I har fået et udkast til – med jeres evt. bemærkninger indarbejdet – til leverandørerne suppleret med en forespørgsel om, hvorvidt leverandøren i øvrigt vil have noget imod, at de oplysninger de har givet på møderne indgår (i anonymiseret form) i rapporten, men således at de er opdelt på de enkelte prisdele – dvs. sådan som vi foreløbig har gjort i rapportudkastet. Så kan vi træffe den endelige beslutning om hvordan vi opstiller økonomiafsnittet, når vi har svar fra leverandørerne.
I må lige sige til hvis der er problemer i denne fremgangsmåde.

Med venlig hilsen

Christian Vigh
Kontorchef, Kommunaljura
Direkte tlf. 7228 2520 / mobil 25 23 92 65
Mail: chv@oim.dk

økonomi og indenrigsministeriet

Slotsholmsgade 10-12
1216 København K
Telefon 72 28 24 00
Fax 72 28 24 01
www.oim.dk

Fra: Marianne Søgaard [mailto:mas@kammeradvokaten.dk]
Sendt: 11. september 2012 15:07
Til: Christian Vigh
Cc: Nicoline Nyholm Miller; Hans B. Thomsen; Milena Anguelova Krogsgaard
Emne: SV: E-valgsrapport - HASTER

Kære Christian

Tak for din mail.

Milena modtog først i dag økonomiafsnittet, og efter at jeg nu har talt med Milena, kan jeg oplyse, at det var hendes opfattelse, at oplysningerne på møderne kunne anvendes til skønsmæssige beregninger til brug for en generel prisramme til rapporten med de usikkerhedsmomenter, der blev anført på møderne. Jeg er ikke bekendt med, hvordan Århus Kommune har anvendt tallene eller har ment, at de skulle kunne anvendes, herunder hvor præcise tal, Århus Kommune mente, at man havde brug for. Det er naturligvis beklageligt, hvis der ikke har været den nødvendige forventningsafstemning om, hvordan I ønskede beregningerne af økonomien foretaget.

Mht. spørgsmålet om aktindsigt, så undrer din tilkendegivelse mig lidt, eftersom det på møderne oplyses, at fortrolige oplysninger ikke vil blive gengivet i rapporterne. Priselementer plejer at være fortrolige oplysninger. Jeg har i dag sagt til Nicoline, at jeg mener, at et alternativ er, at man hører tilbudsgiverne om, hvorvidt de gengivne priselementer er fortrolige. Jeg kan jo ikke svare på, om der findes prislisteoplysninger mv. på deres hjemmesider, som gør, at I med sindsro kan videregive de pågældende oplysninger i den valgte form.

Når jeg i dag rådgav Nicoline, som jeg gjorde, var det ud fra en vurdering af, at afsnittet ikke nødvendigvis bidrog til det store klare økonomiske overblik, og jeg syntes derfor, at genåbningen af dialogen var en bedre vej. Alternativet er naturligvis, at I hører tilbudsgiverne om, hvorvidt i må offentliggøre deres priselementer, som oplyst på møderne.

Et andet alternativ er, at man kigger på tallene igen og forsøger sig med generelle beregninger i stedet for de meget konkret beregninger.

Jeg vil meget gerne tage en drøftelse med dig om, hvad du mener, vi skulle have oplyst tidligere.

Jeg er på vej ind i et møde, men Milena kigger på jeres udkast til mail til tilbudsgiverne, og du får således en tilbagemelding herom snarest.

Mit møde varer formentlig frem til kl 19, men jeg ringer dig gerne op efter dette tidspunkt. Send mig en mail om, hvad du ønsker.

Med venlig hilsen

Marianne Søgaard
Partner, Advokat (L)

Direkte +45 72 30 73 29 | mas@kammeradvokaten.dk
Mobil +45 20 69 52 53 | www.kammeradvokaten.dk

Kammeradvokaten
Advokatfirmaet Poul Schmith

Fra: Christian Vigh [mailto:chv@oim.dk]
Sendt: 11. september 2012 14:06
Til: Marianne Søgaard
Cc: Nicoline Nyholm Miller; Hans B. Thomsen
Emne: E-valgsrapport - HASTER

Kære Marianne
Jeg kan forstå på Nicoline, at kammeradvokaten ikke mener, at vi kan formulere afsnittet i rapporten om økonomien i E-valg sådan som vi har gjort i vores udkast, som er fremsendt til jer for kommentarer, idet vi risikerer at give fortrolige informationer om de enkelte leverandører ved at dele prisen op på de forskellige enheder, og idet det i øvrigt også er for upræcise angivelser. Som jeg har forstået det, er jeres råd at vi genåbner den tekniske dialog, idet vi kontakter samtlige 7 deltager i den tekniske dialog og anmoder hver enkelt om at præcisere oplysningerne om økonomien sådan, at vi får et mere præcist estimat for den samlede pris for gennemførelsen af et E-valg under nogle nærmere angivne forudsætninger.

Problemet er, at vi har skrevet afsnittet ud fra de oplysninger vi har fået på møderne (hvor leverandørerne i øvrigt ikke gav udtryk for at de økonomiske oplysninger var fortrolige vel vidende at vi ville skrive dem i en offentligt tilgængelig rapport). Vi har jo lænet os op ad jeres rådgivning hele vejen igennem, både ved udarbejdelsen af det skriftlige materiale der har ligget til grund for dialogen og ved jeres aktive deltagelse i alle dialogerne. Derfor er jeg nødt til at sige, at jeg synes det er uheldigt, at vi først på nuværende tidspunkt får det råd, at vi burde have grebet spørgsmålet om økonomien anderledes an – og ikke før eller under dialogerne. Det er ikke særlig hensigtsmæssigt i forhold til tidsplanen og ressourceanvendelsen i øvrigt.

Vi er under et stærkt tidspres, også i f.t. ministeren – og derfor har vi besluttet, at vi foreløbig tager økonomiafsnittet ud i den pakke der bliver lagt op til ministeren og sendt ud til kommunalbestyrelserne i morgen.

Vores intention er så, at vi eftersender oplysningerne om økonomien i slutningen af ugen.

For at gøre det muligt at indhente oplysningerne vil det bedste for os være, at vi i dag sender en enslydende mail til alle 7 deltagere med anmodning om, at de præciserer oplysningerne om økonomien under nogle nærmere angivne forudsætninger mhp. at vi kan give et samlet estimat (ikke opdelt på enkeltdele), af både et landsdækkende valg og et mindre forsøg (der er jo en væsentlig forskel) og at de giver os disse oplysninger fredag morgen kl. 8.

Vi har lavet et udkast til mail, jfr. nedenfor.

Vi vil sætte pris på at få jeres bemærkninger hertil – både i forhold til fremgangsmåden og evt. også jeres tekstnære bemærkninger til mailen så hurtigt det kan lade sig gøre. Hvis I mener der er behov for et hurtigt møde kan vi selvfølgelig også arrangere det.

Du må gerne bekræfte at du har fået mailen.

Mvh Christian

Med venlig hilsen

Christian Vigh
Kontorchef, Kommunaljura
Direkte tlf. 7228 2520 / mobil 25 23 92 65
Mail: chv@oim.dk

økonomi og indenrigsministeriet

Slotsholmsgade 10-12
1216 København K
Telefon 72 28 24 00
Fax 72 28 24 01
www.oim.dk

Dear [economic operator]
Thank you again for your participation in the technical dialogue at the Ministry of Economic Affairs and the Interior on [date] on an e-voting solution for statutory elections in Denmark.
One of the issues discussed during the technical dialogue was the matter of the economic implications of e-voting, including the costs of conducting an e-voting pilot project, as the municipalities require information on this aspect in order to make a decision on whether they are willing to commit themselves to a future pilot project for a statutory election.
After going over the information imparted by the economic operators on this issue, the Ministry finds that it is necessary to acquire additional information in order to be able to properly appraise the price range for implementing e-voting solutions, as the data received so far during the technical dialogue is very difficult to process into numbers that will give an indication hereof to the municipalities.
You are therefore kindly asked to provide additional information before ***Friday morning 13 September 2012 at 8:00 a.m.*** *stating a rough estimate of a total price for your solution for two different scenarios based on the following assumptions:*

Basic assumptions for the calculation of rough total for procurement of e-voting system

1. ***An estimation of the total price for 1 election***

   - *Based on a 10 year contract (7 elections) for 4 mill. voters*

   A. *Price for small polling station of 1,500 voters*

   B. *Price for a medium sized polling station of 5,000 voters*

   C. *Price for a large polling station of 10,000 voters*

2. ***An estimation of the price for a pilot project***

   - *Based on the participation of 10 municipalities with 2 polling stations each; one of 5,000 voters and one of 1,500 voters*

Price should include (if applicable according to the solution demonstrated):

- ***Hardware****, including: voting cards activation, voting ballot generators, optical ballot scanner, smart ballot boxes, machine for initialization of tokens, voter verification functionality, printers for polling reports, UPS, etc. – assuming the hardware is purchased and not licenced*

- ***Tokens*** *for initialization of ballot generator*

- ***Software*** *for voting ballot generators, ballot boxes, smartcard readers, election management and interfaces*
- ***Paper rolls*** *for ballots (if used)*
- ***Services and logistics****, including central configuration and testing of equipment, delivery to polling stations, deployment, configuration and test of hard- and software at polling stations before election day, dismounting after elections and storage between elections, maintenance of equipment, change and repair of equipment in case of malfunction*
- ***Support*** *before and during election day in call centre and in polling stations*
- ***Training*** *of election officials and municipal IT-workers in deployment of election hardware*

We understand that this estimate would only be tentative, probably will be calculated on the basis of solutions delivered for other comparable customers and does not preclude the final pricing in the event of a tender process for the procurement of a system for e-voting in Denmark.
Thank you very much for your cooperation, which is much appreciated.

SJ20130213104107600

Dokumentresumé:

Bestilt af : DEPCLH den 13-02-2013 11:41:07
Dokumentnr.: 5719
Titel: Kommentarer fra PWC til 1. råudkast til rapport om teknisk dialog
Dokumenttype: I
Dokumentdato: 06-09-2012
Kontor/enhed: VALG-ENH, Valgenheden
Sagsmedarb.: Nicoline Nyholm Miller, DEPNNM
Indblik:
Versionsnr.: 1
Reg.dato: 13-09-2012
Registreret af: DEPNNM - Nicoline Nyholm Miller

Emneord:

Tekst:

Modtagere:
Afsender PWC , Strandvejen 44

Oplysninger:

Datoer:

Erindringer:

Christina Løtzsch Hansen

Fra: Mikael Buchholtz <MBZ@pwc.dk>
Sendt: 6. september 2012 09:32
Til: Nicoline Nyholm Miller
Cc: Martin Mølgård Povelsen; Jess Kjær Mogensen
Emne: Re: 1. råudkast til rapport om teknisk dialog

Hej

Jeg er imponeret over hvor langt du er kommet på så kort tid. Generelt synes jeg at det ser godt ud og at du har fået mange detaljer med.

Her er vores kommentarer - indlejret i Word Comments. Jeg har blandt andet gennemgået mine noter og skrevet en kommentar ind de steder, hvor jeg synes at der er noget, der mangler.

Med venlig hilsen / Best regards

Mikael Buchholtz
PwC | Manager - PhD, MScEng, ESL
Consulting
D: +45 3945 3544 | M: +45 2460 6330
Email: mbz@pwc.dk | www.pwc.dk
Strandvejen 44, DK-2900 Hellerup

PwC - Revision. Skat. Rådgivning.
Nyhedsbreve med skræddersyet viden - klik her og tilmeld dig Dialog

From: Nicoline Nyholm Miller <nnm@oim.dk>
To: "jel@aarhus.dk" <jel@aarhus.dk>, Mette Marie Sundbøll <A92L@okf.kk.dk>, "'jobn@odense.dk'" <jobn@odense.dk>, "'Milena Anguelova Krogsgaard'" <man@kammeradvokaten.dk>, Janus Sandsgaard <js@oim.dk>, "'Mikael Buchholtz'" <MBZ@pwc.dk>
Date: 05-09-2012 14:14
Subject: 1. råudkast til rapport om teknisk dialog

Kære alle
Her følger – et par timer forsinket – første råudkast til det, der skal blive til en samlet rapport over den tekniske dialog. Som tidligere varslet prætenderer dette på ingen måde at være et hverken helt eller halvfærdigt udkast, men jeg lovede af tidsmæssige grunde at sende jer det, jeg havde på dette tidspunkt til nogle tidligere kommentarer. Rapporten er foreløbig mest deskriptiv; der skal bl.a. tilføjes noget om de valg, som kommunerne må træffe, men det kaster jeg mig over, når jeg snart er færdig med den mere opsamlende del. Kommentarer modtages gerne, hvis I har nogle der er relevante at få allerede nu, gerne særligt til det, I synes der mangler, ellers får I en chance mere, når jeg sender et mere færdigt udkast til jer i løbet af i morgen formiddag.

Tak for dine noter, Jesper, de har været en god støtte og vil sikkert også kunne genkendes hist og her i rapporten ☺

Bedste hilsener
Nicoline

Fra: Nicoline Nyholm Miller
Sendt: 31. august 2012 09:52
Til: jel@aarhus.dk; Mette Marie Sundbøll; jobn@odense.dk; Milena Anguelova Krogsgaard; Maj Skytte Petersen; Louise Brandt Olsen; Christian Vigh; Janus Sandsgaard (js@oim.dk); Mikael Buchholtz
Emne: Bestilling af frokost til teknisk dialog på mandag

Kære alle

På mandag skal vi holde vores sidste tekniske dialog. Tænkte vi skulle prøve noget nyt udi frokosten og vil bestille salater og sandwich fra Redfellas i Illum – jeg vil dog ikke binde an med at gætte jeres favoritter, og vil derfor bede jer om at bruge fem minutter på at vælge en salat eller sandwich fra den vedhæftede menu og sende mig en mail herom i løbet af i dag, så skal jeg nok forsøge at koordinere ☺ Hører jeg ikke fra jer, så gætter jeg mig frem!

Milena – ved ikke, om det er dig eller Marianne, der kommer på mandag, og om Emil evt. også kommer – i givet fald bedes du videresende denne mail. Tak.

Vh Nicoline[attachment "E-valg - rapport teknisk dialog.docx" deleted by Mikael Buchholtz/DK/ABAS/PwC]

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Dokumentresumé:

Bestilt af : DEPCLH den 13-02-2013 11:41:08
Dokumentnr.: 5720
Titel: E-valg - rapport teknisk dialog{PwC-B7dRvB6}
Dokumenttype: I
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Kontor/enhed: VALG-ENH, Valgenheden
Sagsmedarb.: Nicoline Nyholm Miller, DEPNNM
Indblik:
Versionsnr.: 1
Reg.dato: 13-09-2012
Registreret af: DEPNNM - Nicoline Nyholm Miller

Emneord:

Tekst:

Modtagere:

Oplysninger:

Datoer:

Erindringer:

økonomi og indenrigsministeriet

Unit
KOMJUR

Case officer
DEPNNM

Coordinated with
OFFVEL

Case no.

Doc. no.

Date
7 September 2012

Technical dialogue on system for e-voting in Denmark – Summary report

Contents

Executive summary

[vil blive skrevet efterhånden som rapporten skrider frem]

Based on studies of academic research and international experiences as well as the dialogue with the companies participating in the technical dialogue, the Ministry finds that the main benefits to be derived from employing a digital voting and/or counting system are:

A. More accurate count and tally
B. Voter verifiability
C. Provides the disabled with the opportunity to vote without assistance
D. Eliminates spoiled ballots while keeping the option to cast a blank vote
E. Additional 'back-up' storage of ballots
F. Faster count and result

Of these, the Ministry finds that the perspective of more accurate results, enablement of some disabled voters to vote without assistance, elimination of spoiled ballots and the possibility for the voter to count his/her own vote because of their connection to the principle of democracy, inclusion and transparency are the strongest arguments for considering to conduct pilots on e-voting and e-counting in order to make our own experiences in a Danish context.

What have we learned?
The Ministry has experienced that there are many providers working seriously with e-voting that bring to the customer a wide experience in the field and which have been designing and providing e-voting and e-counting solutions for a number of years. The vendors invited to the technical dialogue have been involved in providing e-voting and/or –counting solutions for statutory elections in many different countries in the world as well as for organisations.

One of the most important insights that the vendors have pointed out to the Ministry during the technical dialogue is that **no two solutions or elections are exactly the same**, although they share various similarities. Hence, most solutions follow a modular approach and can be customized to fit the customer's specific needs and standards. This entails in turn that the Ministry and municipalities will have to make a number of **choices** together to find out which requirements... , as there is no 'fool proof' ready-made solution that can just be picked off the shelf and employed successfully for e-voting in any given country, including Denmark. Not start from scratch, but starting point in existing solutions for other countries that most closely resemble what the Ministry and municipalities require, which are them customized.

1. Introduction

This report contains a summary of the discussions conducted during the technical dialogue between the Ministry of Economic Affairs and the Interior with 7 economic operators on a system for electronic voting in Denmark, as well as a short description of the technology demonstrated by the economic operators. In addition, the report includes a tentative estimate of the probable economic implications of introducing e-voting in Denmark for statutory elections based on the data delivered by the economic operators in the technical dialogue.

Following a written request of 27 January 2012 from the mayors of 12 municipalities in Denmark and Local Government Denmark (the interest group and member authority of Danish municipalities, KL) to be allowed to conduct binding trials with e-voting at statutory elections, the Danish government decided on 6 March 2012 to grant all municipalities that wished to do so permission to conduct e-voting pilots, where the result of the poll is binding.

The Minister for Economic Affairs and the Interior, who *inter alia* is responsible for all statutory elections in Denmark, stated the following in her press release of 13 April 2012 on the government's decision to allow pilots on electronic voting:

> "We have to modernise the public sector, which makes it natural to exploit the opportunities offered to us by new technology – also with regard to elections. The pilots shall show whether e-voting offers any significant benefits, which can entail that we should consider digitalising the polling in the longer term.
>
> One of the benefits is that e-voting can eliminate the pile of spoiled ballots, where the election officials are in doubt about where the voter intended to cross the ballot. Another benefit is that e-voting will enable the visually impaired to vote without assistance. Also, e-voting can render the manual count unnecessary on the longer run, which can save the municipalities some resources.
>
> The challenge is whether it is possible to make e-voting secure enough and keep it within an over-all proper financial framework, which the pilots shall also contribute to clarify. I hope that the municipalities will draw some good experiences from the e-voting pilots so that the technology can be spread out to the whole country."
>
> *Margrethe Vestager*

The Election Section of the Division for Municipal Law of the Ministry of Economic Affairs and the Interior has in the meantime been acquiring the necessary expertise and finding the right partners to conduct a project on defining the technical and procedural requirements for an e-voting solution in Denmark and undertake the expected procurement process.

E-voting workshop

As a first step, the Ministry organised a workshop[1] on 15 May 2012 in collaboration with the Demtech research project[2] at ITU (IT-University of Denmark) and the Danish Board of Technology with the participation of more than 40 representatives from the IT-community, the municipalities, IT- and social sciences researchers, election experts, interest organisations for *inter alia* the disabled, civil and human rights, the elderly, etc. The purpose of the workshop was to engage key stakeholders as early as possible in the process and gather their input on the desired requirements for a future e-voting system in Denmark, including the necessary procedures for the preparation, safeguarding and carrying out of electronic voting and -counting.

The Ministry works in close collaboration with the municipalities and participates in the steering committee set up by the 12 municipalities and KL to monitor the e-voting project. In consultation with the steering committee, the Ministry decided in the late spring of 2012 to conduct a technical dialogue with economic operators in the field of electronic voting to acquaint itself with the current technological solutions.

Call of the Ministry for binding commitment from municipalities and further process

In return for the commitment of the Danish government to introduce a Bill that will permit those municipalities that wish to do so to employ electronic voting and counting at statutory elections, the Minister for Economic Affairs and the Interior has asked the municipal councils of the 12 municipalities that originally applied for permission to conduct e-voting pilots for a binding declaration by the 1st of October 2012 of their commitment to allocate the necessary economic and administrative resources necessary for conducting one or more e-voting pilots.

Shortly after 1 October 2012, the Ministry will decide whether to proceed with its efforts to create the necessary statutory authority to enable municipalities to employ e-voting at statutory elections. If a sufficient number of the 12 municipalities have committed themselves, the Ministry will prepare the necessary draft legislation during the autumn 2012 with the aim of introducing a Bill to the Folketing (the Danish parliament) in January 2013. Provided that the Bill is passed, the Ministry and the municipalities will work together to present an invitation to tender in the spring, summer or early autumn of 2013, depending on when the legislative process is concluded.

2. Purpose of the technical dialogue

Prior to the probable tender procedure for the supply of a system for non-remote electronic voting and counting (hence referred to as an 'e-voting system'), the Ministry of Economic Affairs and the Interior has conducted a technical dialogue with 7 economic operators. Invitation for participation requests to the technical dialogue was issued on 28 June 2012 in TED, the online version of the 'Supplement to the Official Journal of the European Union' dedicated to European public procurement, where the conditions for participation were also stated.[3] The deadline for request by economic operators to participate in the technical dialogue was set to 3 August 2012 at 12:00 noon CEST.

As mentioned above, the Ministry has asked the 12 municipalities that have previously expressed their interest in conducting e-voting trials for a binding commitment to allocate the necessary resources to do so. In order to facilitate the decision process of the municipal councils on this matter, the Ministry has promised the councils to provide information on the technical, procedural and economic implications of introducing e-voting technology in statutory elections.

Hence, the purpose of the technical dialogue meetings was two-fold:

1) Part of a 'feasibility study' to give the municipalities a better basis of decision to commit themselves to conduct one or more e-voting trials;

2) To give the Ministry and municipalities an overview of existing technical solutions, thus providing a better ground for drawing up the requirements in a future tender process for the acquisition of an e-voting system.

As part of the preparation of the tender process, the Ministry of Economic Affairs and the Interior wished to explore the possibilities that the market has to offer at this point in time, and to get an overview of the economic implications of introducing e-voting in Denmark.

The Ministry of Economic Affairs and the Interior was interested in consulting with companies that have documented experience with the development, implementation and operation of electronic voting systems for larger companies/institutions, including in particular public institutions. Preference was given to companies that have experience with the development and implementation of electronic voting and counting systems for elections to popularly elected organs.

3. The official announcement

The dialogue was carried out in accordance with the rules of the EU Procurement Directive[4] and the lines indicated by the prior information notice no. 2012/S 122-201846 of 28 June 2012.

The official announcement of the technical dialogue can be found on ted.europa.eu, the online version of the 'Supplement to the Official Journal of the European Union'[5], dedicated to European public procurement.

The rules on the right to enter into a technical dialogue with the market are found in point 8 of the recital in the EU directive on public procurement. The rules have been implemented into Danish law by Executive Order no. 712 of 15 June 2011[6] (in Danish) on the procedures for the award of public works contracts, public supply contracts and public service contracts.

4. Selection of participants

Selection criteria
Particularly out of regard for the resources allocated by the Ministry to carry out the preliminary study, the Ministry decided that a maximum of eight companies/partnerships would be invited to the technical dialogue. In the event that more than eight companies/partnerships requested to participate in the technical dialogue, the Ministry of Economic Affairs and the Interior would invite all companies/partnerships that have documented experience with development, delivery, implementation and operation of electronic voting systems for larger companies/institutions, including in particular public institutions. If more than eight companies/partnerships could document such experience, the Ministry would select those companies/partnerships that have documented experience with the development and implementation of electronic voting and counting systems for elections to popularly elected organs, i.e. elections for national or local parliaments or governments etc. In the event that there henceforth were more than eight companies/partnerships qualified for selection according to the above mentioned criteria, lots will be drawn amongst these.

Companies selected
The Ministry received 11 requests for participation, of which the following 7 companies/partnerships were invited to individual meetings on basis of the enclosed documentation of experience with e-voting at statutory elections:

- Indra
- Opt2vote
- Everyone Counts
- Assembly Voting (Aion & Siemens)
- Scytl & Zetes
- KMD & Smartmatic
- DRS Data Services & Dominion Voting

Procedure
For each invited company or partnership the technical dialogue consisted of one bilateral meeting between the company/ies in question and the Ministry of Economic Affairs and the Interior and its partners. The meetings each lasted approx. 3 hours, of

which approx. 45 minutes were set aside for a demonstration of the e-voting system of the company/ies in question.

The meetings took place during the period of 21 August – 3 September 2012. All applicants were informed that participation in the technical dialogue is neither a precondition for participation in the anticipated procurement, nor will it improve the chances of participating economic operators for eventual prequalification. The companies were informed that the Ministry as a public authority is subject to the Danish Public Records Act and thus can be obliged to give access to documents etc. to the extent following from its obligations under this Act, but that any request for confidentiality re. information imparted during the oral technical dialogues would be respected by the Ministry as far as possible.

Framework
The applicants were informed that a future e-voting system in Denmark will be used only for **non-remote electronic voting** in a controlled environment at polling stations on election day and/or for advanced voting on the premises of the municipalities; not for voting over the internet or by other remote voting channels. The system should thus be employable for the following phases: preparation before the election, polling, counting and notification of the results as well as packing and storing.

The system should also be adaptable to the Danish context and election traditions, i.e. *inter alia* be designed to secure a high degree of recognisability for voters and a continued high trust in elections. The Danish turn-out is among the highest in the world for countries where voting is not mandatory (87.7 per cent at the last general election in September 2011; approx. 65 per cent at local elections). The system must therefore be designed in such a way that the high turn-out and trust in elections are maintained.

Digitalization of the polling implies that some of the control mechanisms meant to ensure public control with the elections will be replaced by digitalized procedures, which can only be checked by specialists with particular insight in it-systems etc. Public control mechanisms in a Danish context would e.g. be the demonstration and subsequent sealing of the empty ballot boxes in front of the voters in attendance before the elections commence at 9:00 a.m., and the voters' right to watch the manual count of the votes after the election is closed at 8:00 p.m. To ensure a continued high trust in elections – hitherto obtained and preserved *inter alia* via the aforementioned public control mechanisms – the Ministry was therefore also interested in obtaining information on alternative control mechanisms, which provide the voter with a comparable high degree of trust that the polling has progressed correctly, i.e. without system failures or any manipulation with the elections. The system should also be trustworthy and robust and ensure that the election can continue even if the system malfunctions partly or completely during the polling.

The system should also guarantee the secrecy of the vote, which in the Danish context entails that the voter not only has the *right* to keep his/her vote secret, but is also under the *obligation* to do so, i.e. the voter is not free to show his/her vote to others. In addition, it must be impossible to connect a voter and the vote he/she has cast, including indirectly by e.g. logging or electronic detection of screen displays or the like by external devices etc.

The system should also be user-friendly and readily accessible to all voters, including voters with disabilities. The Ministry was therefore interested in a presentation of any measures that could render the more accessible to voters with disabilities, preferably allowing them to vote without assistance.

5. Meeting agenda

Before each meeting, the Ministry of Economic Affairs and the Interior sent out an agenda to all participating companies, where it was stated that the Ministry wished to gain closer insight into *inter alia* the following issues:

1. Protection of the secrecy of the vote in general by the e-voting system.
2. Protection of the secrecy of the vote in particular by the use of dedicated hardware vis-à-vis the use of non-dedicated hardware, including processes for safe destruction of sensitive data.
3. The securing by the e-voting system that the polling has passed off without incident, including by the production of a physical manifestation of the vote (VVPAT or similar) that can both offer sufficient proof to the voter that the polling has passed off correctly and be included in a manual recount.
4. The safeguarding by the system of correct polling and registration of the vote and the possibility to control that the system has not failed or been manipulated along the way (security).
5. The possibility to secure accessibility to the system for the disabled.
6. The economic implications of introducing the e-voting system of the company/ies in question in Denmark, divided into the expenses for a) the purchase or leasing/accommodation of hardware, b) the purchase or leasing of soft ware, c) service and operation, back-up, training, maintenance etc.
7. Possibilities for further development of the system and possibilities to adjust the e-voting system for future needs and update it to exploit new technological possibilities (possibility for agile development and innovation).
8. Possibility of scaling of the system, including information on the possibility to separate the polling and counting functionalities, so that the system initially could be limited to ballot marking, but later can be connected to a digital counting device if desired.
9. Usability in general and for the disabled in particular
10. Advantages and gains of e-voting in general and in particular from employing the e-voting solution demonstrated

6. Benefits and risks of electronic voting and counting

Benefits
Based on the Ministry's study of academic research and international experiences as well as the dialogue with the companies participating in the technical dialogue, the Ministry finds that the main benefits to be derived from employing a digital voting and/or counting system are:

A. More accurate tallying

Electronic counting can undoubtedly offer more accurate tallying and as good as eliminate human errors in the counting process. Sharing their experience re. manual counts conducted to audit the electronic tallying, one of the vendors described as a common incident that a new result is usually reached each time the votes are recounted by hand. Only after an audit unit is brought in and three auditors have counted the ballots together and have agreed on the result the numbers will come out exactly the same after each count, and they incidentally match the results of the electronic tallying.

Lessons learned: When manual counts are to be conducted for audit purposes after the electronic tallying (either as a complete recount or random checks), a proper procedure must be implemented to minimize human error. E.g. counts should be undertaken by independent auditors or officials that have not been participating in the election all day, where the risk of them not being capable of conducting a recount under optimal conditions is significantly enhanced compared to if you bring in a "fresh" team. Also, the recount should be undertaken in teams of 2 or 3, where all individuals must agree on the result before it is compared with the electronic tally.

B. Voter verifiability

Unlike the paper-based tallying process, which happens after the voter introduces his/her ballot in the ballot box and is carried out by election officials, all the demonstrated electronic counting systems offer the voter the possibility to scan his/her vote before inserting it in the ballot box either manually or by transitional Hence, the voter is enabled to verify him/herself that the vote is actually counted, which could further augment the voters' trust in the election system.

C. Provides the disabled with the opportunity to vote without assistance
All the systems demonstrated during the technical dialogue include features that are designed to enable voters with disabilities to cast their vote without assistance. The range of disabilities covered by the different solutions and their usability vary, but all do to some extent undoubtedly make it possible for some groups of disabled voters to cast their vote unsupervised. (see section xx below)

From a democratic perspective, the Ministry believes it is important that as many voters as possible have the opportunity to participate in and have a say in the political process though inter alia the exercise of their right to vote. This is furthermore in alliance with the commitment of the Danish public authorities to protect the right of persons with disabilities to vote by secret ballot in elections and public referendums without intimidation, as e.g. expressed in the UN Convention on the Rights for Persons with Disabilities, article 29 (a)(ii) on participation in political and public life. In line with this, the opportunities that are provided by e-voting technology vis-à-vis the disabled are important to the decision on whether e-voting should be introduced in Denmark despite the overall well-functioning of our current paper-based system.

D. Eliminates spoiled ballots while keeping the option to cast a blank vote
At the general election on 15 September 2011, 34,307 of the 3,579,675 votes cast (0.69 %) were spoiled votes. Of these, 22,815 were blank votes and 11,492 votes were spoiled votes, i.e. invalid for other reasons, the last corresponding to 0.32 % of all the votes that were cast. In the experience of the Ministry, the large majority of these spoiled votes have not been purposefully spoiled by the voters; the majority of the voters having cast a spoiled vote other than a blank vote are thus under the wrong impression that their vote has been correctly cast and counted and forms part of the overall result.

While this number may not seem very significant in the overall picture and at least for parliamentary elections is not likely to have had any decisive influence on the election results taken as a whole, the Ministry finds it problematic from a democratic perspective that a noteworthy number of voters unknowingly and involuntarily have cast an invalid vote. In addition, in local municipal elections, where the results sometimes differ by a few votes only, the Ministry cannot in principle rule out that the spoiled votes could have a decisive influence in some municipalities, from the results of the contest between candidates to the actual party nominated for the post of mayor. Hence, the Ministry finds that the possibility to eliminate or at least significantly reduce the number of spoiled votes other than the blank votes is another important benefit to take into account in the decision on whether e-voting should be introduced in Denmark

E. Additional 'back-up' storage of ballots
Another benefit of e-voting and/or counting that some of the vendors have emphasized and that has not previously been considered in the Danish debate is the extra security provided by the electronic storage of the ballots and results in parallel with the physical storage of the paper ballots or VVPAT's. This offers redundancy as the result of the poll can be reproduced if for some reason the paper ballots or VVPAT's should be damaged, destroyed or lost, thus avoiding a second ballot as the ultimate consequence if a significant number of ballots cannot be produced for the count or recount for one of the reasons previously mentioned.

The Ministry recalls an incident during the last parliamentary elections, where a number of advance votes were destroyed close to election day when the town hall building in which they were stored burned down. The matter was ultimately solved by identifying most of the voters through the electronic log of the processed administrative steps performed in connection with the advance votes that had hitherto been cast in the municipality. The voters were notified singularly in writing about the loss of their advance vote and encouraged to present themselves to the municipality and vote again. Had the votes been cast or stored electronically, it would however probably have saved the municipality from some administrative hassle during an otherwise very busy time close to the elections and would have provided a faster solution to the problem without the involvement of the affected voters.

F. Faster count and result

E-counting *ipso facto* enables a much faster tally and result. While this may be an important issue in countries where the tallying of manually cast paper ballots because of infrastructural or other challenges hence could be reduced from 1-2 weeks to a few hours, the Ministry finds that this particular benefit apart from the obvious interests of the press and the political parties and candidates is not the strongest argument in favour of electronic voting and counting. The results in Denmark are produced in just a few hours, and in the passing time the tradition of "voting night" on television

The Ministry is however aware that a faster and more accurate count and tally probably also offers significant advantages from the administrative point of view of the municipalities, in that the election staff after a long day will have a natural incitement to let their administrative staff and election officials go home, as well as the digitalization of the counting and tallying will also probably on the longer run decrease the number of appointed electors and other election staff needed on election day and particularly after the polling is finished.

G: Reduce resources for manual counting

Lessons learned

Of all the potential benefits listed above, the Ministry finds in particular that 1) the perspective of more accurate results, 2) enablement of some disabled voters to vote without assistance, 3) elimination of spoiled ballots and 4) the possibility for the voter to count his/her own vote offer the strongest arguments for considering to conduct pilots on e-voting and e-counting in order to make our own experiences in a Danish context. All these benefits are connected to the principle of democracy, inclusion and transparency.

The Ministry recommends that the municipal councils considering engaging in e-voting pilots have a thorough discussion of the enlisted and other possible potential benefits of e-voting and e-counting, and ultimately decide which of these should be guiding for the municipalities' overall strategy for conducting e-voting and/or e-counting pilots.

Risks and pitfalls

The greatest risks or pitfalls of introducing and employing e-voting and/or (to a lesser extent) electronic counting is in the opinion of the consulted vendors not so much a question of technology flaws or security issues, but more of *perception* and *trust*.

For this reason, some vendors recommend introducing e-voting by a step-by-step approach, starting out slowly and giving the voters sufficient time to familiarise themselves with the changes and get to trust the system by seeing it work in a satisfactory way in numerous elections. One vendor pointed out that in their experience voters are generally receptive and positive towards the introduction of technology in the election realm, while scepticism is often mainly expressed by candidates and political parties. Therefore, it is important to conduct independent audits after the elections that can prove beyond any reasonable doubt that the election has not been tampered with and that the results have been correctly counted and tallied.

Kommentar [DKMBZ1]: This point could be included.

Some vendors have highlighted the reduction of resources used for manual counting as an advange.

However, I would stress that this is an advantage that would come over time AND that the it at the present time is very difficult to say whether there is any economical benifits in the because the economical aspects are still uncertain.

Also, the quote above from Margete Vestager included this point, so it may be a good idea to cover it somewhere.

Denmark has one of the highest turn-outs in the world among countries where voting is not mandatory (87.7 % for the last general election in 2011 and 65.8 % for the last municipal and regional elections in 2009). It is imperative for the Danish government to preserve a high turn-out for elections in Denmark regardless of any changes in the voting procedures, here amongst any eventual transition to electronic voting and/or counting. The issue of preserving trust in the electoral system is therefore of high importance to the Ministry and will guide its further endeavours in the field of e-voting.

Lessons learned: The issue of perception for the sake of preserving the voters' trust in the election system is of imperative and must be very carefully considered. The Ministry therefore believes that any change to the electoral system, e.g. e-voting and/or counting, should be approached very carefully and implemented step-by-step.

Naturally, the issues of *security against malfunction and manipulation* of an e-voting system and the matter of preserving the voter's privacy and the secrecy of the ballot are equally very important issues to consider and protect when drawing up the requirement specifications for a future e-voting/e-counting solution and during the procurement process, see further below.

Choices have to be made

Most vendors can provide customized solutions and employ a modular methodology. The vendors all operate in several different countries with a large variety of election systems, where the lesson learned and imparted to the Ministry during the technical dialogue is that no two election systems are the same, sometimes not even within the same country (e.g. USA). Therefore, if Denmark wishes to make its own experiences with e-voting, a number of **choices** will have to be made by the politicians.

A. **Ballot generator or merely ballot counting?**

Firstly – given that remote voting via the internet or similar is not being considered and therefore is left out of the equation – there is the possibility to procure some kind of **ballot generator machine (e-voting machine, EVM)**, a solution that may or not may be attached to an e-counting solution. This type of solution involves an electronic ballot marker placed in a traditional voting booth, which in the solutions demonstrated for Denmark print some kind of VVPAT that functions as the ballot paper and has to be placed in a ballot box with a scanning functionality (optional) after the voting has been completed. This is the solution the public and many politicians usually think of when discussion arises on e-voting.

But as the technical dialogue has shown, there is also an option to opt for a more limited solution of a **ballot counting and tallying device** that enhances the method in which votes are counted, whilst minimising the changes to the way in which votes are cast. This system requires that the voter marks a paper ballot by hand and subsequently takes the marked paper ballot to an image scanner device. Here the voter must insert the ballot, which is scanned by the tabulator. The system demonstrated provided a functionality that allows the voter to privately verify his/her selections on the scanner's LCD screen.

B. **Dedicated or commodity hardware?**

Secondly, the choice has to be made between **dedicated and non-dedicated hardware.**

.... [indføre flere af de valg, der skal træffes]

Kommentar [DKMBZ2]: I would rather say that in order to preserver voter 'strust in the system the vendors gave the following recommendations for successfully introducing electronic election:
1) Step-by-step approach
2) Make it look like the existing process so the voters are familiar with the procees
3) Be transparent, enable the voter to verify as much as possible
4) Deliver on time
5) Make it secure

Kommentar [IoS3]: Eller er det alle? Er Assembly Voting også fleksible? De har i sagens natur ikke så mange moduler I værktøjskassen, da de stadig arbejder med udviklingen af deres produkt – hvad synes I?

Kommentar [DKMBZ4]: Jeg ville skrive "most". F.eks. virkede opt2vote som om deres fleksibilitet lå i at lave specielle rapporter. Med "most" har I ikke sagt for meget eller for lidt.

Kommentar [DKMBZ5]: A list of some choices to be made:
- VVPAT. Is is ok that the voter has to use a machine provided by "the government" to verify the vote (i.e. rely on expert control) or must a vote be able to verify it himself (i.e. must it be in clear text)
- Will you allow counting at the voting box or only after 8.00 pm?
- Is it an option to use some of the other voting schemes the vendors mentioned (see comment below)
- Open source vs open for special auditers

Another important realisation is that the more "black boxes" you introduce in the solution you choose, the more public trust and verifiability is delegated to experts and potentially stand to suffer.

7. Demonstration of solutions

The Ministry was presented with **7** different approaches and solutions for digital voting and/or counting. Based on the description given in the EU information notice of the preliminary considerations by the Ministry and municipalities as to the framework of the upcoming e-voting pilots, the vendors presented **six different ballot generating systems** with the optional possibility of e-counting devices and **one ballot scanner solution**. All but one vendor offered a demonstration of some of their voting/counting equipment that the vendors estimated would be relevant in a Danish context.

The range of systems demonstrated can roughly be divided into two:

1) electronic **voting** solutions with the option of electronic counting and tallying,

2) electronic **ballot scanning**, counting and tallying solutions.

~~2)~~3) Additionally, a number of other electronic voting schemes where discussed.

Kommentar [DKMBZ6]:
Could be briefly summarised below. Possibly with an argument of why you don't think that these would be relevant in Denmark

1) Connected terminal.
   a.a la internet voting but with a local network at the polling place (e.g. opt2vote + (everyOneCounts))
   b.Privacy issues: it is difficult for the voter to verify that the network system protects privacy. This system is not transparent.

2) Direct-eletronic recording (DRE)
   a. A ballot marker, which also records the vote directly (on paper or electronically) in the voting boot
   b. Security issues: Voter is alone in the boot with the votes.
   c.Bad experience from Germany

3) Central optical scanners.
   a. Scans votes in one or more central places.
   b.Does not give benifits C, D, E
   c.Fits badly with the Danish system where votes traditionally are counted at the polling place.

4) Internet voting/supervised internet voting
   a.Out-of-scope

Ad 1) Solutions with electronic voting

All e-voting solutions (i.e. ballot generators) demonstrated are more or less structured the same way:

The voter goes to his/her polling station and presents his/her polling card, which is matched against the current manual or electronic electoral register. The voter is handed a token, which can either be a smartcard with a chip similar to a credit card or a credit card sized cardboard card with an integrated RFID-chip. The token can either be handed to the voter, or the voter can choose any random token from e.g. a tray to enhance the voter's trust that his/her privacy is protected and that the token does not contain any personal information on the particular voter. The token can also either be initialized before the election (which will take time) or for reasons of time constraint and transparency be initialized at the polling station by the election official in front of the voter before it is handed to the voter or ultimately by the voter him/herself, again with the purpose to convince the voter that no personal information is stored on the token. The token will be activated and can be stored with particular information identifying e.g. the voting district that the voter belongs to (which is handy if the voter is e.g. voting in advance and needs a different ballot than the one that corresponds to the particular municipality where the advance voting is taking place) or whether the voter is disabled and special features need to be activated in the EVM, e.g. the screen should be turned off etc.

The voter enters the polling booth and inserts the token into the ballot generator (EVM). The machine is initialized and the ballot interface activated so the voter can make his/her choice. All solutions demonstrated employ a touch screen, so the voter makes his/her choices by touching the different options on the screen. Some solutions in addition offer a digital pen for voters who prefer to use such a device. Most solutions offer a multiple layer solution, in which the voter first is presented with a frame enlisting the different parties and the option to cast a blank vote. If the voter wishes to cast a preferential (personal) vote for a particular candidate, the voter has to choose the party that the candidate belongs to in order to be presented with a new frame showing the different candidates that are standing for the party in question. The interfaces shown varied a great deal in design and usability (some tried to the design of the actual Danish ballot paper, others opted for a more simple design), but all vendors assured that the interface could be customized to fit the customer's wishes. The voter then has to confirm his/her choice (always retaining the option to have second thoughts and change their choice right up to the step where the voter is asked to final-

ly confirm) and a ballot (VVPAT) is printed by the machine. Systems employing smartcards will print a separate ballot on paper (different qualities and thicknesses were demonstrated, but can almost always be customized), where the vote is printed in both a human readable format (fonts etc. can be customized) and a 2D QR bar code (for scanning purposes that will enable electronic counting and tallying) and handed to the voter. If the system employs a card board card with RFID, the vote will be printed on the same card that was used to initialize the EVM and returned to the voter. The vote will be encrypted and either stored in the RFID and printed on the card in a human readable format or could also be limited to OCR-recording in print with no electronic trace stored in the RFID. The bar codes displayed on the ballot papers/VVPAT's are encrypted and cannot be read with mobile phone QR-scanners or similar, but have to be decrypted first.

All solutions that include storage of the vote on a 2D bar code offer some kind of verifiability functionality, so the voter can choose to scan the bar code and verify that it corresponds to the human readable text imprinted on the ballot paper/VVPAT. The verifiability scanner can either be integrated in the EVM so the voter can immediately check the bar code in the same voting booth after the ballot is printed, or placed in a separate location, e.g. a secluded booth. The last option has the advantage from a trust-perspective that the voter will not have any reason to suspect that the text displayed on the screen after the scan of the bar code is not what is actually recorded in the bar code, but what the machine 'remembers' that the voter has voted).

Solutions that employ a smartcard entail that the smartcard has to be deposited by the voter after the voting is completed; this can be done either so the machine offers a functionality that "swallows" the smartcard after it has been inserted into the EVM by the voter, or alternatively (most solutions) the smartcard is handed back to the voter by the machine after the voting has been completed, and the voter then has to deposit the smartcard in a separate or hand it to e.g. the election official supervising the ballot box.

The voter then proceeds to the ballot box and scans the ballot him/herself and deposits it in the ballot box. Some solutions entail that the voter has to scan the ballot and then insert it manually in the ballot box, while others offer transactional operation, meaning that the ballot is placed manually in a slit or similar in the ballot box and then trapped and deposited mechanically into the ballot box. While a transactional method prevents the voter from leaving with the ballot/VVPAT after it has been scanned and counted, there is the risk that the ballot is not inserted correctly or inserted askew; creating a paper jam that until the ballot box is fixed by an election officer will prevent other voters from depositing their vote in the machine. Also, there is a risk that the secrecy of the vote will be compromised if the election officer has to handle the voter's ballot in the process of fixing the transactional device. Either solution will – as many of the other choices that will have to be made when choosing the kind of system that is deemed most appropriate for the Danish context – require a trade-off between the benefits the different choices offer and some of the disadvantages they result in in return.

When the polling is closed at 8:00 p.m, the votes can either be counted manually and/or electronically, whereafter the system procedures a report of the electronic count and tally. The results can be transmitted to the central tabulation computer either by a secure wireless internet system , modem or 3G or by a USB etc and then collected and inserted into the central computer and tallied there.

Common to all solutions demonstrated is that the ballot is <u>not</u> stored in the EVM (they are in other words not DRE-solutions[7]), but <u>only</u> on the VVPAT, until it is introduced in the ballot box, where it can be scanned and stored electronically or simply inserted for manual count without any electronic recording of the ballot.

The benefits and risks/ downsides of this type of solution can be summarised as follows:

BENEFITS	RISKS AND DOWNSIDES
• Elimination of spoiled ballots while retaining the possibility to cast a blank vote	• Can be difficult to use for some voters, especially during a transitional phase, and can lead to queuing by the voting booths if voters take longer to make their choice
• Disabled and dyslectic voters can vote without assistance with special functionalities	• Some voters will question whether the solution is secure and the privacy and secrecy of the vote is sufficiently protected
• Voters are given the possibility to verify themselves that their vote is counted	• Risk of negative public campaign against the EVM-solution that could seriously damage public perception and trust regardless of whether the criticism voiced is valid
• Faster and more accurate count and tally	• Introduction of black boxes and delegation of public control to experts
• Potential administrative savings as less manpower will be needed for a manual count and recount (on the longer run)	• Expensive, especially if procure a dedicated hardware solution

Kommentar [DKMBZ7]: Risk increases without dedicated hardware

Kommentar [DKMBZ8]: Risk increases the more complex the solution becomes: e.g. it VVPAT is an encrypted barcode

Kommentar [DKMBZ9]: Et meget groft slag på tasken ville være at hardware koster 1/3 af den samlede udgift. Så det er nok ikke dedikeret hardware, der alene vælter budgettet. Jeg ville bare skrive "Expensive, comparet to ballot scanning option"

Ad 2) Solutions with electronic ballot scanning and e-counting

One vendor demonstrated an alternative approach, in that this vendor unlike the other six does not supply a ballot generator, but an optical scanner that can scan paper ballots marked by hand by the voter

The first part of the procedure is similar to the procedure currently employed. After being checked in the electoral register, the voter is handed a paper ballot similar to the one currently used. The design of the ballot can be customized according to the customer's wishes. The voter goes to a secluded voting booth, where the voter marks the ballot with a pen, ticking off or filling in a box or circle beside the party or candidate of his/her choice.

The voter then proceeds to the ballot box, which is mounted with a scanning device and tabulator on top and a small screen on the side. The voter inserts the ballot in the scanner, which will read the ballot and show the result on a small LCD screen beside the scanner, allowing the voter to verify his/her selections privately. If the voter has under- or overvoted or somehow invalidated the vote by filling it out incorrectly, a text on the screen will alert the voter and ask the voter whether he/she wishes to proceed nevertheless, or whether the voter wished to retract and exchange the ballot for a new one in accordance with the existing rules. The voter marks his/her choice (CAST if satisfied or RETURN vote if they wish to have their ballot returned for correction or exchange to a new ballot). If the voter has chosen to cast the vote, the ballot will then be transitioned mechanically into the ballot box; otherwise it will be pushed out of the scanner so the voter can retrieve it. The voter can be required to place the ballot in a card board folder before scanning it to protect the secrecy of the vote.

In the experience of the vendor, approx. 800 voters per hour can use the machine, but it will ultimately depend on the length and complexity of the ballot.

The solution offers a special functionality for disabled voters that can mark the ballot for them, see section xx below for further details.

The benefits and downsides of this solution can be summarised as follows – some – but not all – will be similar to benefits offered by EVM's:

BENEFITS

- Elimination of unknowingly spoiled ballots, retaining the possibility to spoil a ballot on purpose in other ways than casting a blank vote if a voter wishes to do so
- Disabled and dyslectic voters can vote without assistance with special functionalities
- Voters are given the possibility to verify themselves that their vote is counted
- Faster and more accurate count and tally
- Potential administrative savings, as less manpower will be needed for a manual count and recount (on the longer run)
- Easy to use and more recognizable solution from a voter's perspective
- Security issues not as pressing as with EVMs
- Greater transparency
- Relatively cheap in procurement, services and maintenance compared to EVM's, especially the ones with dedicated hardware, because of the more simple solution and a need for a significant smaller amount of HW (roughly corresponding to the number of ballot boxes currently employed with an additional safety margin).

DOWNSIDES

- The solution does not include e-voting and experiences with e-voting will thus not be obtained if the municipalities limit the scope of the solution to an optical scanner.
- Might be perceived by some as lacking sufficient ambition

Kommentar [DKMBZ10]: This is a matter of interpretation/ definition of what e-voting means.

If the voter uses an electronic device to cast his/her vote then I would assume that it is e-voting. In this solution the voter press CAST/CANCEL on an eletronic device... So isn't this strictly speaking e-voting?

You can be the judge of whether this comment is relevant.

Kommentar [DKMBZ11]: I would disagree with the phrasing... It is still critical that the machine counts correctly and hence security *is* a critical component. Also their ballot marker for disabled people must function correctly.

However, the system is simpler, so it is not so complex to verify the security.

7.1. Protection of secrecy of the vote

Protection of the secrecy of the vote is one of the most important
Risks identified, how these are met
What technical and procedural safeguards are recommended

7.2. Dedicated versus non-dedicated hardware

Most vendors employ dedicated hardware in their solution, although in combination with commodity hardware for e.g. optical scanners, touch screens etc. The hardware

encased in the ballot generator machines is mostly industrial standard components. The dedicated ballot generator machines have an average life span of 15-20 years according to the vendors. The main argument of these vendors for employing dedicated hardware is *security*, claiming that dedicated hardware offers better security against visual and electronic eavesdropping, better logical protection. Also simplified installation, deployment and maintenance are cited as some of the important benefits of dedicated hardware as opposed to a solution based solely on standard off-the-shelf components.

A couple of the solutions demonstrated to the Ministry are nevertheless based solely on commodity 'off-the-shelf' hardware instead; one of the vendors argued that the trend in their opinion is moving away from procurement of expensive dedicated hardware with what it entails of warehousing, maintenance, and obsolescence issues to software and services. This vendor offers to install their soft ware in a wide variety of hardware components, and propose to lease the hardware, arguing that the commodity hardware can be securely wiped after elections and reused for other purposes.

Lessons learned: The advantages and disadvantages of dedicated hardware versus non-dedicated hardware can be summed up as follows:

	Dedicated hardware	Commodity hardware
Easier to restrict access to parts and internal hardware	✓	
Easier installation and technical assistance	✓	
Easier to use for voter and election officials	✓	
Replacement of components	✓	✓
Ensure privacy	✓	✓
Less costly		✓
Possibility to reuse HW for other purposes		✓
HW independence		✓

Kommentar [DKMBZ12]: This will be more complex to do with commodity hardware. E.g. protection agaist electronic evesdropping + deletion of data after the election

Kommentar [DKMBZ13]: I would add a point about "no need for software portability" in favour of dedicated hardware.

If you want hardware independce the then software needs to be developed for and teste on differents kinds of hardware. That make it more costly to make.

7.3. VVPAT

7.4. Security and safeguarding

7.5. Accessibility for the disabled

All solutions demonstrated to the Ministry during the technical dialogue have different accessibility features that allow one or more specific groups of disabled voters to vote without forfeiting the anonymity of their vote, i.e. by enabling them to vote without assistance by a third party, e.g. a family member or election official. Even the more simple solution (an optical ballot scanner without ballot generator functionality) can be added a component that enables disabled voters to mark their paper ballot electronically. In this instance, the mark produced by the voting device is randomly chosen from a wide range of different marks to resemble a mark made by hand, thus protecting the secrecy of the vote in that the ballot will not stand out from ballots marked by hand). The solutions have all been developed and tested in cooperation with different associations for the disabled and live up to different standards.

Other functionalities presented allow for the use of sip-and-puff devices, joy sticks, buttons, pedals, head-and-mouth pointers, enlarged fonts on screens, adding of key boards and audio enabling. The solutions that employ smartcards to initiate the ballot generator machine all have the possibility to have information added to the smartcard indicating that the voter is blind/visually impaired or otherwise disabled, thus instructing the ballot generator to either turn off the screen or allow the use of a special feature.

All solutions include a feature for blind and visually impaired that incorporates some kind of audio 'read aloud' functionality. While some systems employed buttons allowing the blind/visually impaired (and other disabled voters like voters with severe Parkinsons, dyslectics etc.) to navigate through the ballot and making their choice, others transformed the touch screen from the ballot interface into a screen simply allowing the voter to press one side of the screen for "yes" and the other side for "no".

All vendors of ballot generators emphasized that the different disability functionalities as default are added to *all* ballot generator machines, so voters needing these functionalities can chose any voting booth containing the machine instead of being assigned to a particular voting booth, with the exception of the optical scanner solution. Finally, many vendors emphasized that the ballot interface shown on the touch screen or (for the optical scanning solution) on the printed ballot can be added party-logos or pictures of the candidates for easier recognition.

A common fact for all systems for the disabled to take into account is that voting for the disabled using any of the described functionalities will invariably require more time.

Lessons learned: While all solutions as mentioned at the least incorporated a functionality for allowing blind and visually impaired voters to vote independently, only a few of them demonstrated how a blind or visually impaired voter would know which way to fold the ballot to fold it correctly, so the human readable text is not shown to anyone else before or during the insertion of the ballot into the ballot urn. This issue would have to be solved in order to ensure the secrecy of the vote of blind and visually impaired voters.

Kommentar [DKMBZ14]: Additionally, Many vendors pointed out that their solutions where co-designed with the disabled organisations locally.

7.6. Economic implications

Udkast skrives af Aarhus Kommune

7.7. Scalability

7.8. Innovation, agile methodology and possibilities for further development (transferability)

7.9. Separation of functionalities/modularity

7.10. Audit/certification

Certification must be undertaken before election. Machines and SW should be sealed to protect genuine... Many of the systems presented to the Ministry have been audited by 'the big four' auditing companies (PwC, Ernst & Young, Deloitte and KPMG) as well as by academics employed by the customers etc.

7.11. Open source and proprietary rights

Open source is a philosophy, or pragmatic methodology in production and development that promotes free redistribution and access to an end product's design and implementation details. The claim has been made that the requirement of open source

Kommentar [DKMBZ15]:
Some vendors argued:
Open souce means greater transparency...
And transparency is a hallmark of elections

All vendors declared themselves ready to hand over the system soft ware for independent review, while retaining property of the solution. Some vendors sell the software to the customer to do with it as the customer seems fit, including having other companies or in-house capacities develop the software, others provide the software on a license basis. Some of the vendors will honour a requirement to allow open source disclosure, while all are prepared as a minimum to disclose the source code, processes and procedures to independent review and audits. Other solutions indicated was the model chosen in Norway for the solution procured for the pilots at 10 municipalities for the local elections in November 2011. Here, the vendor accepted open source, but on the condition that the Norwegian government does not exploit the source code for commercial use, and that the solution is only allowed to be used in Norway, thus enabling the vendor to sell the same or a similar solution to other customers in other countries.

Many of the vendors consulted employ Linux based operating systems etc., which are open source. A couple of vendors favour and employ proprietary technologies. In the opinion of the vendors, whether or not an e-voting system is open source is not as determinative as whether it is properly audited before put into use.

7.12. Training and services

All vendors offer training and services as part of their solution. Training can be designed to meet the customer's need. Many vendors provide e-learning tools as a supplement to on-site training. Most vendors employ a train-the-trainer methodology, as it *inter alia* is viewed as most cost-effective. Some international vendors usually choose to work with a local partner to provide support and other services. All manuals can as a rule be provided in the customer's local language (i.e. in Danish), and calling centres will be staffed with native speakers.

7.13. Implementation

Most vendors stated a lead time of between 6-18 months from contract signing to election day. This period will however depend on the scale of the procurement; if the solution is being procured only for a limited pilot of 10-30 polling stations, the implementation time of the system will naturally be shorter than if the solution is being procured for the whole country. Stages to be considered when drawing up the project plan include blue print stage (for definition of inter alia the requirements), voter engagement and information campaign (should be initiated as soon as possible and in good time before the election), adaptation of solution to Danish standards and approving of design, independent review/certification of HW, SW, and procedures, manufacture of machines, tests and mock election(s), sealing, training of election staff and finally roll-out of solution, delivery tests etc. However, all companies that the Ministry has met with have vast experience in adapting and customising their solutions to meet the specific needs of the customer, and can also offer some flexibility re. implementation.

[1] http://evalg.teknoprojekt.dk/
[2] http://www.demtech.dk/#
[3] http://ted.europa.eu/udl?uri=TED:NOTICE:201846-2012:TEXT:EN:HTML
[4] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:134:0114:0240:EN:PDF
[5] http://ted.europa.eu/udl?uri=TED:NOTICE:201846-2012:TEXT:EN:HTML
[6] https://www.retsinformation.dk/Forms/R0710.aspx?id=137281
[7] Direct-recording electronic (DRE) voting machines record the voting data and ballot images in memory components in the EVM.

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Dokumentresumé:

Bestilt af : DEPCLH den 13-02-2013 11:35:12
Dokumentnr.: 7074
Titel: Udkast til samlet prisoverslag for forsøg med e-valg til Kammeradvokaten
Dokumenttype: U
Dokumentdato: 19-09-2012
Kontor/enhed: VALG-ENH, Valgenheden
Sagsmedarb.: Nicoline Nyholm Miller, DEPNNM
Indblik:
Versionsnr.: 1
Reg.dato: 20-09-2012
Registreret af: DEPNNM - Nicoline Nyholm Miller

Emneord:

Tekst:

Modtagere:
Modtager Kammeradvokaten , Vester Farigmagsgade 23

Oplysninger:

Datoer:

Erindringer:

Christina Løtzsch Hansen

Fra: Nicoline Nyholm Miller
Sendt: 19. september 2012 09:32
Til: Marianne Søgaard
Emne: Udkast til samlet prisoverslag for forsøg med e-valg

Prioritet: Høj

Kære Marianne
Vi havde vist ikke aftalt, at jeg ville sende dig mit bud på et samlet prisoverslag, men Christian vil gerne have det ind forbi jer for en sikkerheds skyld, så jeg håber meget du har tid til at øje det igennem (det er ikke langt) – de angivne prisoverslag indeholder den samlede laveste pris (de facto prisen for stemmeseddelscannerløsningen) og den højeste pris (stemmemaskinerne) og er så nu angivet som et prisspænd, så identificering af leverandørerne er gjort så svær som muligt.

Vores vurdering er umiddelbart, at prisoverslagene er lidt højt sat af Århus Kommune, så vi har forsøgt at gardere os ved at henvise til, at prisoverslagene er fiktive, og det ikke er til at sige, om de afspejler prissætningen i en regulær konkurrencesituation – som du måske har hørt fra Milena, har nogle af de store spillere allerede tilbudt at udlåne udstyr og software gratis, hvis der er tale om et mindre forsøg, så kommunerne kun skal betale for service m.v., men det kan vi på den anden side heller ikke love kommunerne, så det skrevne er et forsøg på at undgå, at de bliver skræmt helt væk ved det worst case scenario, som jeg nok mener priserne er udtryk for.

Jeg arbejder hjemme i dag, så en go/no go tilbagemelding på mail er fin, ellers træffes jeg på mobil 3195 9242, hvis der skal flere ord på. Needless to say, vi vil gerne have det ud i dag ☺ (skulle jo have været i går, men det nåede vi så ikke). På forhånd tak.

Bedste hilsener
Nicoline

SJ20130213103511328

Dokumentresumé:

Bestilt af : DEPCLH den 13-02-2013 11:35:11
Dokumentnr.: 7076
Titel: Kammeradvokaten godkender ukast til samlet prisoverslag for forsøg med e-valg [KA-Active.FID26680]
Dokumenttype: I
Dokumentdato: 19-09-2012
Kontor/enhed: VALG-ENH, Valgenheden
Sagsmedarb.: Nicoline Nyholm Miller, DEPNNM
Indblik:
Versionsnr.: 1
Reg.dato: 20-09-2012
Registreret af: DEPNNM - Nicoline Nyholm Miller

Emneord:

Tekst:

Modtagere:
Afsender Kammeradvokaten , Vester Farigmagsgade 23

Oplysninger:

Datoer:

Erindringer:

Christina Løtzsch Hansen

Fra: Marianne Søgaard <mas@kammeradvokaten.dk>
Sendt: 19. september 2012 12:28
Til: Nicoline Nyholm Miller
Emne: SV: Udkast til samlet prisoverslag for forsøg med e-valg [KA-Active.FID26680]

Kære Nicoline

Det var præcis, hvad jeg mente. Jeg synes, at det er smukt. Jeg ringer lige for at sikre mig, at du selv er tilfreds nok med indholdet.

Med venlig hilsen

Marianne Søgaard
Partner, Advokat (L)

Direkte +45 72 30 73 29 | mas@kammeradvokaten.dk
Mobil +45 20 69 52 53 | www.kammeradvokaten.dk

Kammeradvokaten
Advokatfirmaet Poul Schmith

Fra: Nicoline Nyholm Miller [mailto:nnm@oim.dk]
Sendt: 19. september 2012 09:32
Til: Marianne Søgaard
Emne: Udkast til samlet prisoverslag for forsøg med e-valg
Prioritet: Høj

Kære Marianne
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Bedste hilsener
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