Challenging the Norms and Standards of Election Administration: Electronic Voting*

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Unlike the other papers in this series, this one does not attempt to provide a consensus view of the experts on international best practices. Electronic voting is still a relatively young technology, and no consensus has yet emerged.[1] Instead, this paper offers suggestions to international donors about how they should evaluate and respond to requests for help implementing electronic voting systems. It specifically addresses direct recording electronic (DRE) voting systems and their implementation in new, fragile, and transitional democracies (for the purposes of this paper, "new, fragile, and transitional democracies" refers to countries which hold or plan to hold elections but have a limited or nonexistent history of successful free and fair elections).

While some countries claim that their adoption of DRE systems has improved the electoral process, there is little evidence to support these claims, particularly in transitional settings. After considering the advantages and disadvantages of such systems, this paper identifies key questions to ask before adopting a DRE system and proposes a limited role for international donors when new, fragile, and transitional democracies request assistance with electronic voting.

I. Elections and Technology

The information technology revolution has affected election management in a number of ways. Electoral authorities use computer systems to make their internal management and communications more effective, to systematize voter registration records, and to communicate with voters, among other tasks. In recent years, computerized voting has also become prevalent, starting with the adoption of optical scan voting and counting systems in the 1980s and extending more recently to DRE voting systems. DRE systems require a voter to indicate a choice or choices using a computer interface (often either a push-button or a touch-sensitive screen); the voting computer records the votes and eventually calculates the totals. The use of DRE technology has expanded rapidly in the United States since the 2000 elections—from 12 percent in that election to 29 percent in 2004—often encouraged by the availability of federal funds.[2]

DRE technology is in wider use outside of the United States. India, the world's largest democracy with 660 million registered voters, moved to full DRE voting in its 2004

[1] Several organizations have issued technical standards. See, for example, *Report on the Compatibility of Remote Voting and Electronic Voting with the Standards of the Council of Europe*, adopted by the Venice Commission, 12-14 March 2004, and the extensive documentation of the U.S. National Institute of Standards and Technology at www.vote.nist.gov. These efforts are valuable in the context of mature democracies, but they should not be seen as full answers to the often different questions and problems posed by elections in transitional democracies. NIST recommendations, for example, have been adjusted to meet the specific fiscal and management requirements of U.S. counties (http://news.com.com/Panel+changes+course,+approves+e-voting+checks/2100-1028_3-6140956.html). While reasonable within its own terms of reference, these considerations are not useful guides to decision making in transitional environments.

[2] GAO, "Elections: Federal Efforts to Improve Security and Reliability of Electronic Voting Systems Are Under Way, But Key Activities Need to be Completed" (September 2005), p. 10. Available at http://www.gao.gov/new.items/d05956.pdf.

general elections, deploying roughly one million specially designed push-button machines.[3] In 2002, Brazil used roughly 400,000 touch-screen DRE machines for its first fully DRE general election.[4] Venezuela, Ecuador, and other new, fragile, and transitional democracies have also used DRE systems. The use of DRE technology in these elections has fed a growing interest in DRE voting in a wide range of democracies, including new, fragile, and transitional ones. Nigeria's Independent National Electoral Commission announced its intention to use DRE voting in 2007 by including a provision in the Draft Electoral Bill. However, it was changed by the legislators, and the law now says, "The use of Electronic Voting machines for the time being is prohibited." Lebanon's draft electoral law calls for computerized vote counting (although not DRE voting).[5] In the Palestinian Authority and in Iraq, electoral authorities have requested international advice and assistance in computerized and specifically DRE voting operations.

DRE technologies in general raise a number of serious concerns among election professionals. The use of these technologies in new, fragile, and transitional democracies raises still more serious concerns. As pressure for DRE voting builds in these democracies, the international donor community will be forced to decide whether and how to support the deployment of these technologies.

II. Advantages of DRE Voting

Before assessing the possible role of international assistance, we must consider why DRE voting technologies are attractive and why they cause concern (discussed in section III). While not exhaustive, the following list summarizes the major issues raised by electoral authorities in new, fragile, and transitional democracies with respect to DRE voting.

1. Ease of counting

Mechanical voting systems, optical scan voting machines, and DRE systems have all been introduced in order to make vote counting and result tabulation faster and more accurate. This is a serious and important consideration, but it applies in only a small number of elections: namely, elections based on ordered preferences (such as alternative vote and single transferable vote) and elections involving a large number of races and/or referenda questions. Although any election can be conducted using hand-counted paper ballots, these two categories of elections can require time-consuming, costly, and error-prone hand counts, making mechanical or computerized voting systems attractive.

However, few new, fragile, and transitional democracies use ordered preference voting or conduct a large number of races at a single time. Although there have been examples of such elections, such as Bosnia in 2000, these have all been successfully managed without using DRE systems.

2. Ease of voting

Voter confusion can lead to effective disenfranchisement, especially of vulnerable voters (such as illiterate or elderly voters). In Afghanistan's 2005 parliamentary elections, 5

[3] Election Commission of India (ECI) powerpoint. Associated Press, 20 April 2004. Available at http://www.wired.com/news/evote/0,2645,63137,00.html?tw=wn_tophead_4
[4] Kenneth Benoit, "Experience of Electronic Voting Overseas," which is Appendix 2J of *Secrecy, Accuracy and Testing of the Chosen Electronic Voting System* (Commission on Electronic Voting, Ireland, 2004), p. 315. Available at http://www.cev.ie/htm/report/download_first.htm.
[5] Internal IFES translation of the draft electoral law, 2006.

percent of ballots were rejected as spoiled or blank. This is a high proportion in international practice and can be attributed both to Afghanistan's confusing system of representation and high illiteracy rates.[6] DRE technology promises to reduce such figures by making spoiled ballots impossible and unintentionally blank ballots difficult. The Caltech and MIT Voting Technology Project has argued the technology can minimize "lost" votes in a variety of ways.[7] DRE technologies also allow for more sophisticated voter interfaces, potentially resolving many voter access problems for those with disabilities or those using minority languages. Visual interfaces may also be useful for illiterate voters, but (as noted below) this presumption has not been rigorously tested in environments with little computer literacy.

However, in minimizing one potential for voter error, DRE systems may simply increase another. Voters unfamiliar with computers may not cast spoiled or blank ballots, but they may still cast ballots that do not accurately record their intended choice. MIT and Caltech note the possibility of such unintended consequences, reporting that in the United States "since 1988, three percent of voters using hand-counted paper and scanned paper ballots had no vote recorded for Senate or governor, but seven percent of voters using lever machines recorded no vote for Senate or governor."[8] DRE voting systems have not been rigorously tested in the kinds of environments with low literacy rates and limited technical knowledge normally found in new, fragile, and transitional democracies. While the Election Commission of India claims that their DRE system is "User friendly – can be used even by illiterates," neither the electoral authorities in India nor Brazil have published studies of voter interaction with their DRE technology.[9] Without such studies, both the utility of DRE voting and the correct approach to voter education are difficult to establish.

3. Fraud prevention

Electoral authorities have often claimed that DRE or other voting technologies can combat or even prevent fraud. In Brazil, a spokesman for the Superior Electoral Tribunal argued that Brazil's DRE systems are "100 percent fraud free" in contrast to earlier election procedures, which produced charges of uncounted ballots or tampered ballot boxes.[10] The Election Commission of India has made similar arguments, asserting that DRE technology combats common Indian electoral fraud problems, such as capturing polling places or stealing ballot boxes.[11]

However, these election officials do not offer any compelling basis for their expansive claims, and there is no evidence that DRE machines make an appreciable difference in the incidence of electoral fraud. As happened in India prior to the use of DREs, polling places can still be "captured" (i.e., local heavies can monopolize voting booths, voting multiple times), as can DRE machines as they are transported to central tally locations. More importantly, as will be argued below, the use of DRE technology in fact creates dangerous new possibilities for fraud or allegations of fraud.

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[6] Andrew Reynolds, "The Curious Case of Afghanistan." *Journal of Democracy* 17.2 (2006), 113-4.
[7] Caltech / MIT Voting Technology Project, "Voting: What Is, What Could Be" (2001). Available at http://www.vote.caltech.edu/reports/2001report.htm.
[8] "Voting: What Is, What Could Be," p. 8.
[9] Election Commission of India (ECI) presentation, Associated Press, 20 April 2004. Available at http://www.wired.com/news/evote/0,2645,63137,00.html?tw=wn_tophead_4
[10] Associated Press 3 October 2002.
[11] Associated Press 20 April 2004. Available at http://www.wired.com/news/evote/0,2645,63137,00.html?tw=wn_tophead_4.

4. Cost reductions

It is often claimed that DRE technology reduces the cost of election administration.[12] Such claims seem credible on their face, as we are accustomed to information technology measures increasing efficiency and thus reducing cost in a range of business and government activities. The cost arguments made for DRE technologies all rely on middle- or long-term projections, though, as the initial investment costs are recouped by lower ballot printing and transportation costs. Despite this, there are no longitudinal studies to confirm these projections. Repair and replacement of DRE equipment, warehousing of DRE equipment in secure and climate controlled facilities, salaries for skilled maintenance workers and trainers, and other continuing costs may well make DRE technologies less cost effective. If voter verified paper records are produced, as described below, the additional costs of paper, toner, printer maintenance, and transportation must also be factored in.

5. Status

Many experienced technical assistance providers fear that election technology, including DRE systems, are deployed more to assert a country's (or electoral authority's) modernity than in response to any specific need. According to elections expert Rafael López-Pintor, "It has become a status symbol for many organizations and countries."[13] This may become more prevalent as the U.S. adoption of DRE technologies is highlighted by the media, and as important developing nations, such as Brazil and India, receive attention for their DRE technologies. (Though it is also possible that it could become less prevalent as stable democracies, such as the Republic of Ireland, consider and reject DRE technology.)

III. Disadvantages of DRE Voting

The above discussion has made clear that many of the claims made about the advantages of DREs are largely unsubstantiated, particularly in new, fragile, and transitional democracies. Against these weakened advantages, one major disadvantage must be highlighted: damage to the reliability and credibility of the electoral process.

1. Damaged credibility of the electoral process

Any computer program can have an undetected, unintentional error (a "bug"). Any computer program can be changed by malicious programming ("hacked") in a way that is undetectable after the fact.[14] This is true of all manufacturers and, in fact, of all computer software. Various measures can reduce a DRE system's vulnerability, including computer security, physical security, testing and analysis of systems and coding, and good election procedures. None of these steps, and no combination of these steps, can change the irreducible, immutable vulnerability of computer systems. For example, the computer security techniques used in India's DRE systems make it unlikely that they could be reprogrammed by a person with limited, casual access to them (such as a voter), though the machines used in the United States are vulnerable to such attacks.[15]

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[12] Presentation shown to the author by staff of the Election Commission of India on April, 20 2004.
[13] Rafael López-Pintor, "Comparative Costs and Cost Management Case Studies Report" in *Getting to the CORE: A Global Survey of Registration and Elections* (UNDP/IFES, 2006), p. 44.
[14] See www.verifiedvoting.org; see also, Ariel J. Feldman, J. Alex Halderman, and Edward W. Felten, "Security Analysis of the Diebold AccuVote-TS Voting Machine" (September 13, 2006). Available at http://itpolicy.princeton.edu/voting/ts-paper.pdf.
[15] Ibid.

Even the Indian systems are vulnerable to programmers with more extensive access to the DRE machines, such as electoral officials.

This vulnerability means that election results can be manipulated; it also creates the danger that legitimate election results will not be accepted, because allegations of manipulation cannot be refuted conclusively. There are two recent examples of this threat to election credibility. In 2004, Venezuela held a presidential recall referendum. President Hugo Chávez won handily, with 58 percent of the vote. The elections were observed by former U.S. President Jimmy Carter and by the Organization of American States, and both reported that no fraud had been observed. However, because 90 percent of votes were cast on DRE machines, the opposition was not persuaded by the observation reports—and for good reason. The observers could not attest to the reliability of the DRE systems themselves. Unlike elections with paper ballots and hand counts, simply observing the process from beginning to end cannot ensure that no fraud has been perpetrated. While computer scientists critical of DRE voting examined voting statistics and found no patterns that would substantiate the specific allegations of fraud, this possibility cannot be ruled out. In addition, in Ecuador in 2006, technical failures of voting machines in the Guayas province led to allegations of fraud and the temporary detention of a representative of the Brazilian technology provider.[16]

Allegations about DRE voting results can quickly corrode trust in election results because they cannot be proved or disproved. In Ohio, 64 percent of Democrats believe that the 2004 presidential vote count was not fair and accurate, as opposed to 30 percent who believe that it was.[17] In new, fragile, and transitional democracies, such insidious doubt about an election result could well undermine the election and the credibility of any elected government.

It may be possible to salvage the utility of DRE voting by using voter verified paper ballots (VVPB). DRE systems that produce VVPBs allow voters to confirm their choices on a permanent, hard-copy record. In order to be effective, VVPBs need to meet several criteria. First, they must not compromise the secrecy of the vote, so they should not be recorded in order on a paper tape. Second, the printouts must be legible, and procedures should encourage voters to confirm their contents. Third, in case of differences between paper ballots and digital records, the paper ballots must prevail. Fourth, procedures must be in place for extensive, correctly randomized hand-count audits after all elections.

However, VVPBs bring their own challenges. If VVPB procedures are put into place, the additional cost and complexity may well make DRE voting prohibitively expensive, especially for relatively simple elections. In addition, there must be clear procedures for using the VVPBs to determine or verify the election outcome. The DRE systems used in Venezuela in 2005 produced paper records, but because there were insufficiently rigorous audit procedures, the opposition did not accept the ad hoc audits conducted after the election—and academics at Harvard and MIT confirmed the opposition's claims about the unreliability of the audit process.[18]

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[16] MISNA, "Ecuador: Electronic vote-count company rep held" SperoNews (October 20, 2006). Available at http://www.speroforum.com/site/article.asp?id=6211.

[17] CBS/NYT, "Campaign 2006: Ohio" (October 17, 2006), question 65, p. 26. Available at http://realclearpolitics.com/RCP_PDF/NYT-CBS_OHSen.pdf.

[18] Ricardo Hausmann and Roberto Rigobon, "En busca del cisne negro: Análisis de la evidencia estadística sobre fraude electoral en Venezuela" (September 3, 2004). Available at http://www.proveo.org/hausmann.pdf.

2. Operational and logistical constraints of transitional environments

In addition the major disadvantage of DRE voting—that it can undermine the electoral process—several less dramatic dangers must also be considered. These all relate to the practicality of DRE voting in difficult environments. Training of election officials and voters, secure storage and maintenance of the machines, power supplies, replacement machines and parts must all be considered when debating the use of DREs in new, fragile, and transitional democracies. In particular, poll worker training requires special attention, as few poll workers will be experienced computer technicians, able to correctly respond to computer errors (they may even be too unfamiliar with computers to describe the error to remote technical assistants). The use of VVPBs also complicates poll worker training because of the mechanical problems often associated with printers.

Technical complications and spiraling costs have already created problems in the adoption of sophisticated electronic procedures in new, fragile, and transitional democracies. In East Timor, an electronically compiled voter registration was eventually discarded, despite its great cost. In Kosovo, a combined civil and voter registration experienced severe problems, although these were eventually corrected through a series of additional registration periods. In Nigeria in 2007, an electronic voter registration raised serious concerns about its use in the April 2007 elections. In each of these cases, the problem has been a combination of insufficient technicians, computer illiteracy at the grass roots, insufficient training for those managing and utilizing the technology, and equipment ill suited to the physical rigors of the country. Voting technologies are inherently more difficult to deploy than registration technologies because of their larger scale. Many more machines, technicians, power sources, logistics bases, etc., are required to conduct an election than to register voters.

IV. Adopting DRE

This paper is not intended as a guide to jurisdictions considering the adoption of DRE voting technologies. It is, instead, an analysis which may be helpful to international donors considering how to support electoral processes deploying or debating DRE technologies. Nevertheless, it is important to draw together the advantages and disadvantages of DRE voting as described above into a list of issues for consideration by electoral management bodies, in part because analysis of these issues would be important to any donor projects. In the author's view, careful consideration of these issues will most likely lead to a rejection of DRE voting technologies in new, fragile, and transitional democracies.

1. Public and political support

The most critical element of the successful adoption of any electoral reform is broad support from the public and from political actors. DRE voting technologies must be a reaction to a widely perceived need, and they must be accepted as reliable and transparent.

2. Appropriate technologies

DRE voting technology must be able to manage whatever range of elections and systems of representation are required; they must be robust to the physical environment in which they will operate, and they must be user-friendly to the intended voters. In addition, they must be rigorously tested and certified. This requirement is more difficult than it may appear. The laboratory that tested "most of the [U.S.'s]

electronic voting systems" was barred from certifying voting equipment in the summer of 2006 because they failed to follow their own testing and documentation protocols, calling into question the reliability of the equipment they have already certified.[19]

3. Operations and logistics

An electoral management body must have staff with sufficient computer skills to manage the DRE voting process at all levels, including technicians at the polling level and more senior technicians in managerial positions. Controlled storage and transportation must be available to maintain the machines in working condition and to deliver them to polling locations. Power supplies must be available and reliable, either at the polling location or to charge batteries.

4. Consideration of alternatives

The need to undertake special "integrity" measures in emerging democracies has long been understood by practitioners. Integrity measures include "voter security and ballot security," with the latter defined as "arranging the voting and counting in such a way that the voter lists, ballot papers, tallies, and other result records are *tamper-proof* (emphasis added)."[20] While "tamper-evident" may be a more accurate term, the concept is valid. DRE voting technologies that do not employ VVPB are not tamper evident and are therefore dangerous to credible elections. Such technologies used in new, fragile, or transitional democracies pose profound risks to the legitimacy and effectiveness of elected governments and to the gradual development of democracy.

Before turning to the potential for international assistance, it is important to note the existence of a reliable alternative to DRE voting – paper ballots and hand counts. With correct procedures, paper ballots counted by hand at the polling station in the presence of observers and political party agents allow for an almost perfectly transparent electoral process. Although fraud is still possible, it can be detected and proved by adequate observation.

V. Role for International Assistance

Given this stern conclusion, it is not obvious that international assistance should play a role in DRE transitions, but interest in—if not adoption of—DRE technology seems inevitable. Given the international community's interest in promoting the best possible electoral processes, even under difficult circumstances, donors must find ways to support countries considering or adopting such technologies. This paper proposes appropriate donor roles for three phases of the adoption process: assessment, implementation, and observation.

1. Assessment

Many electoral authorities will find DRE technologies attractive, at least in the abstract, and will assess the possibility of adopting them. The international community can provide useful expert assistance at this phase, as it often does when new, fragile, and transitional democracies consider other important electoral reforms, such as the drafting of new electoral laws or the creation of new electoral authorities. Assessments should focus on the following issues:

[19] Christopher Drew, "U.S. Bars Lab from Testing Electronic Voting," *New York Times* (January 4, 2007).
[20] Pintor, *Getting to the CORE: A Global Survey of Registration and Elections*. 15-6.

- What problems are DRE technologies intended to solve? Based on empirical experience and theoretical considerations, is DRE technology suited to solving these problems? Are other techniques available to solve these problems?
- Have all practical considerations been raised? These should include tender processes, technical expertise, warehousing and maintenance, power supplies, staff capacity, and replacement.
- Have all stakeholders been consulted? As with other important electoral reforms, political parties, civil society organizations, voters, elected officials, and other stakeholders need to be consulted in an inclusive and wide-ranging process. International advisors can help to structure consultations and public option research activities (such as polling and focus groups).

2. Implementation

Donors are accustomed to providing the "hardware" and "software" of traditional electoral processes in the form of the procurement of election materials and the provision of expert advisors. It may seem natural, then, to provide similar assistance to DRE voting transitions, for example through procurement of equipment and provision of computer specialists. Because such projects might also allow lucrative contracts to national technology firms (as has been the case in computerized voter and civil registration projects in Kosovo and East Timor), they may seem doubly tempting. Nevertheless, donors should be very cautious in providing implementation assistance to DRE transitions.

Procurement of DRE equipment is not analogous to procurement of traditional election materials for various reasons:

- DRE equipment, as described above, is irreducibly non-transparent. While some nationalist forces may object to international donors providing ballot boxes, ballots, and polling kits, it is difficult to make credible allegations that the donor is manipulating the electoral process through such procurements. This is clearly not the case with DRE voting.
- DRE equipment requires maintenance, updating, and replacement. The procurement of ballot boxes or ballots from a given supplier in a given election does not bind the electoral authority to the same supplier for future elections. DRE technology, however, is not "mix-and-match." Procurement from a given supplier binds the electoral authority's future decisions, perhaps becoming a point of unhappiness if the donor reduces its commitment over time.

Provision of computer experts for DRE voting is also not analogous to provision of traditional election experts, and for a similar reason: procedures and forms designed by international advisors can be understood and assessed by all participants in the electoral process, including voters, political actors, and observers. Specifications and codes for DRE equipment are not accessible in the same way and so may raise issues of international interference.

Therefore, under most circumstances, direct support to DRE transitions should not be provided. However, electoral authorities may request other forms of international assistance during transitions to DRE voting. Traditional forms of assistance (such as legal, procedural, and voter education support) may still be required. Donors should consider the use of DRE technology in determining whether to provide such support.

Donors are understandably reluctant to provide direct support to electoral authorities that are corrupt or incompetent; if donors support their elections at all, it is usually at arms length. Donors should be similarly reluctant to support electoral authorities using DRE technologies without appropriate safeguards, especially VVPB. To the extent that this reluctance is overcome in any specific cases, assistance could well be useful in the operational implementation (as described above). Poll worker training, maintenance and logistics, and voter education will all be complicated by DRE transitions. International donors could play a useful role in sharing best practice experience between countries.

3. Observation

Even the best election observation cannot solve the transparency problems with DRE described above. However, good election observation can review system design and, perhaps, undertake extensive technical validation of a prototype DRE terminal.[21] Such efforts may be important if election results are contested, but they are unlikely to be determinative.

Donors can provide enhanced technical assistance to independent observers, international observers, and political party agents to help them grapple with the specific problems of DRE voting. This assistance can include computer expertise and funds for independent technical validation by a reputable laboratory.

[21] Kåre Vollan, "Observing Electronic Voting" (Norwegian Centre for Human Rights/NORDEM, 2005) Available at http://www.humanrights.uio.no/forskning/publ/nr/2005/1505.pdf.