How to make EVMs hack-proof, and elections more trustworthy

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Abstract

Free and fair elections are the expression of democratic emancipation. India's electronic voting machines (EVMs) are well-suited to Indian electoral conditions, and are better in terms of security than paper ballots. However, we still need to improve on two front: physical security of the EVMs, as well as mandatory risk limiting audits of the paper trail.

By Invitation
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Free and fair elections are the expression of democratic emancipation. India has always led by example: the Nehru Committee sought universal adult franchise in 1928, at a time when France didn't let women vote, and laws in the USA allowed disqualification of poor, illiterate, and African-American voters. But how reliable are our voting systems, particularly in terms of security?

Electronic voting machines (EVM) have been in use for general elections in India since 1999 — having been first introduced in 1982 for a by-election in Kerala. The EVMs we use are indigenous, having been designed jointly by two public-sector organisations: the Electronics Corporation of India Ltd and Bharat Electronics Ltd. In 1999, the Karnataka High Court upheld their use, as did the Madras High Court in 2001.

Since then a number of other challenges have been levelled at EVMs, but the only one that was successful was the petition filed by Subramanian Swamy before the Supreme Court in 2013. But before we get to Swamy's case and its importance, we should understand what EVMs are and how they are used.

The EVM used in India are standardised and extremely simple machines. From a security standpoint this makes them far better than the myriad different — and some notoriously insecure — machines used in elections in the USA. Are they "hack-proof" and "infallible" as has been claimed by the ECI? Not at all.

Similarly simple voting machines in the Netherlands and Germany were found to have vulnerabilities, leading both those countries to go back to paper ballots.

Because the ECI doesn't provide security researchers free and unfettered access to the EVMs, there had been no independent scrutiny — until 2010. That year, an anonymous source provided a Hyderabad-based technologist an original EVM. That technologist, Hari Prasad, and his team worked with some of the world's foremost voting security experts from the Netherlands and the US, and demonstrated several actual live hacks of the EVM itself and several theoretical hacks of the election process, and recommended going back to paper ballots. Further, EVMs have often malfunctioned, as news reports tell us. Instead of working on fixing these flaws, the ECI arrested Prasad (for being in possession of a stolen EVM) and denied Princeton Prof Alex Halderman entry into India when he flew to Delhi to publicly discuss their research. Even in 2017, when the ECI challenged political parties to "hack" EVMs, it did not provide unfettered access to the machines.

While paper ballots may work well in countries like Germany, they hadn't in India, where in some parts ballot-stuffing and booth-capturing were rampant. The solution as recognised by international experts, and as the ECI eventually realised, was to have the best of both worlds and to add a printer to the EVMs.

These would print out a small slip of paper containing the serial number and name of the candidate, and the symbol of the political party, so that the sighted voter could verify that her vote has been cast correctly. This paper would then be deposited in a sealed box, which would provide a paper trail that could be used to audit the correctness of the EVM. They called this VVPAT: voter-verifiable paper audit trail. Swamy, in his PIL, asked for VVPAT to be introduced. The Supreme Court noted that the ECI had already done trials with VVPAT, and made them mandatory.

However, VVPATs are of no use unless they are actually counted to ensure that the EVM tally and the paper tally do match. The most advanced and efficient way of doing this has been proposed by Lindeman & Stark, through a methodology called "risk-limiting audits" (RLAs), in which you "keep auditing until either you've done a full hand count or you have strong evidence that continuing is pointless". The ECI could request the Indian Statistical Institute for its recommendations in implementing RLAs. Also, it must be remembered, current VVPAT technology are inaccessible for persons with visual impairments.

While in some cases, the ECI has conducted audits of the printed paper slips, in 2017 it officially noted that only the High Court can order an audit and that the ECI doesn't have the power to do so under election law. Rule 93 of the Conduct of Election Rules needs to be amended to make audits mandatory.

The ECI should also create separate security procedures for handling of VVPATs and EVMs, since there are now reports of EVMs being replaced 'after' voting has ended. Having separate handling of EVMs and VVPATs would ensure that two different safe-houses would need to be broken into to change the results of the vote. Implementing these two changes — changing election law to make risk-limiting audits mandatory, and improving physical security practices — would make Indian elections much more trustworthy than they are now, while far more needs to be done to make them inclusive and accessible to all.

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