

# Southern African Region Leading the Way in Election Technology: 2009–2019 Review of Global Standards and Unanswered Questions

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## Abstract

This article presents essential tools that can help to devise a standard set of requirements and attributes for any form of electoral technology adopted across the continent. A number of countries in the southern African region have turned to a variety of technological solutions in a bid to make elections more efficient and cost-effective and to strengthen stakeholder trust at each stage of the electoral cycle. Indeed, Africa has become a testing ground for technological leapfrogging. Election management bodies and Southern African Development Community observer teams are in the spotlight, but this leaves more questions about electoral capacity – problems that sometimes extend to the top of the African Union – which means that the African Union should adopt an incremental technological approach when dealing with electoral observations, capacity-building and political problem-solving across the entire continent. However, in many cases, the technology does not necessarily improve trust in the process or deal with all the problems associated with elections it was intended to resolve. As a result, concerns about the sustainability of electoral technology remain unanswered. The information for this study was gathered from an online search of secondary academic literature on electoral system management, published reports, legal mandates and official websites of the election management bodies studied. The lessons of the past decade show that technology has great potential to strengthen electoral integrity, but its introduction and use must be grounded in well-designed

policies, underpinned by adequate safeguards and supported by legislation that is adequate to deal with the issues that it raises. The article attempts to assess emerging trends and to speculate about the way in which they may affect the electoral process over the next decade. There is a need to examine how recent technological advancements could contribute further to enhancing electoral integrity and participation and how they can be integrated into the process in a sustainable manner.

**Keywords:** Southern African Development Community (SADC), Election Management Bodies (EMBs), observers, technology, standards, elections

## Introduction

Increasingly, it is being realised globally that credible elections are a major factor in promoting democracy, democratisation and good governance. As noted by the International Institute for Democracy and Electoral Assistance (Reynolds, Reilly and Ellis, 2005), elections in democracies play a vital role in ensuring representation of the popular will. They help to secure the legitimacy of the political system. In addition, they are vital to political socialisation and the exercise of political influence, and serve as the foundation for democratic stability and renewal (Dulani and Van Donge 2005; Lindberg 2006a, 139–151; Lindberg 2006b; Esser and De Vreese 2007, 1195; Diamond 2010a). According to Dyck and Gimpel (2005, 531), the electoral history and landscape of southern African countries have been transformed by major factors since the 2000s (Nohlen, Krennerich and Thibaut 1999). These are the results of the end of the post-Cold War period and the deepening of democratic roots; the improvement of paper-based electoral registers; the announcement of election results; the publication and declaration of election results; the contribution of social media networks towards civil society agitation for political liberalisation or pluralism, and the monitoring of government responsibilities (Matlosa 2002). The amalgamation of these technological aspects propelled southern African states, in particular, deliberately and systematically to steer their electoral management systems away from the practice of elections being one event which ceased on election day, as used to be the case, and from the one-party, one-person or military regimes of the early 1960s to the 1980s.

To this end, technology is playing a role in enhancing the integrity of electoral processes and strengthening trust between stakeholders (Chan 2017; Juma 2017). The use of biometric technology in voter registration has enabled election management bodies (EMBs) to improve the accuracy of voters' rolls by providing an effective mechanism to identify duplicate entries in voter registries. The use of biometric technology to verify voters' identities on Election Day has also contributed to enhancing trust in the electoral process. Similarly, technology is also providing EMBs with ways to count and tabulate elections and transmit results more quickly through measures such as electronic voting

or transferring election data through mobile technology (Chan 2017; Juma 2017). This makes it possible to announce election results sooner, potentially diffusing tension in closely contested elections and strengthening trust in the process. According to some research, despite its cost, biometric technology can be a worthwhile economic investment for a country even if it decreases the likelihood of serious post-election violence by only a few percentage points (Chan 2017; Juma 2017).

## **Objectives**

In the light of the growing use of information technologies in elections in the Southern African Development Community (SADC) region and across the continent, this article suggests a standard set of requirements and attributes for any form of electoral technology. The rationale is to contribute to the process of systematising and standardising electoral observation missions (EOMs). A series of methodologies has been developed in the past: these include the Principles for Election Management, Monitoring and Observation (EISA/ECF 2003; AUC 2007) of the African Union Charter of Good Elections. The goal is both to help strengthen member states' electoral systems and to bolster those institutions that run elections (EISA/ECF 2003).

## **Related Work**

### **Information and Communication Technologies in Electoral Processes: Assessing Experiences over Several Electoral Cycles**

The increasing reliance by EMBs on new technology for improving the credibility of the electoral process and enhancing the integrity of electoral outcomes has become pivotal in contemporary elections around the world (IDEA 2014a; 2014b). Such new solutions are commonly deployed in the areas of biometric voter registration and accreditation, electronic verification and authentication of voters, the issuing of smart voters' cards. They are also used in information systems (GIS) to delineate voting boundaries and to geo-reference existing and/or newly created polling stations, establish sophisticated databases of registered voters and develop electronic voting machines and mobile applications for collating and transmitting election results electronically. With EMBs' rapid adoption of new technology having taken place over the past decade, it is now opportune to take stock and reflect on how technology has affected electoral administration around the world (IDEA 2014a).

The lessons of the past decade show that technology has great potential to strengthen electoral integrity. But its introduction and use must be grounded in well-designed policies underpinned by adequate safeguards and supported by legislation that can deal adequately with the issues that technology raises. Otherwise, technological applications may lead to the erosion of public confidence in electoral processes (IDEA 2014a; 2014b).

Elections are best characterised by using the electoral-cycle approach. Figure 1 depicts the three main phases of the electoral cycle.



**Figure 1:** The electoral cycle (adopted from IDEA 2014a)

This model is an important universal tool for use in election management. The concept of the electoral cycle has been advanced by the IDEA and the European Commission (EC) to move the current focus on planning for a single election to one on promoting sustainable election planning (Abdellatif et al 2016). There are a number of visual representations of the cycle, but all of them divide election planning into three distinct phases:

1. Pre-election period
2. Election period
3. Post-election period.

The electoral cycle plays an important role in planning and executing an election timetable. This timetable is a legal document and an operational plan that also conveys information to the public, political parties and the media about the dates for the start and

end of key election activities. This enhances transparency and creates a positive public image for the electoral body (Aparicio and Ley 2008; IDEA 2014a).

There are promising signs of and encouragement for further review of the engagement of internet-based technologies (IBTs) within the broader context of the entire electoral cycle. IBTs have the potential to inspire and build confidence in the EMBs. This article anticipates that this may be done by a number of processes and different blocks and layers, which has been shown to promote trust among stakeholders. This approach has been welcomed by election commissions globally.

### **The Benefit of IBTs in Election Processes**

Several studies have been conducted on using computer technologies to improve elections (Diamond 2010b). An IBT is a tool that can add value to the electoral cycle when it is divided into phases, each with its own special technologies because each has its own set of technical prerequisites and problems (Oppliger 2002, 8). Maphephe (2013, 10) states that advanced voter-registration systems are used to search algorithms that identify possible duplicate registrations, often by using specialist applications such as a facial recognition system (FRS) and an automatic fingerprint identification system (AFIS) to match records and identify possible fraud. Biometric technology is one such technology used to achieve fast, user-friendly authentication with a high level of accuracy (James and Joshi 2015). These applications make oral processes more transparent, free and fair, trustworthy, consistent and reliable, inclusive and accessible to all. They also facilitate printing and make it possible for data entries to be edited, processed, saved, retrieved and restored at any given point (Fujiwara 2015; Nhlapo et al 2014).

### **Role of Observers and EMBs**

The work of EMBs and electoral observers on electoral cooperation, management, and observation and analysis of the subject suggests that the SADC countries are increasingly using new technologies to administer elections. From the computer programs used to register candidates or handle other types of election-related procedure to modern systems for transmitting results and the use of electronic voting machines, very few processes have been devoid of the use of these technologies (Organization of American States 2007).

There is a growing interest by EMBs and observers in the SADC region in recognising a longstanding track record in observing elections. It is a fact that there has been a growing need in this area to modernise observation methodologies and techniques through the design and application of a standardised methodology, one that is specially created for situations in which technology plays an important role in the electoral process. It is both challenging and discourages members of electoral communities only where there are insufficient tools to guide EMBs' work effectively in a highly automated

electoral process. For new administrative mechanisms there is a need to establish some kind of guidelines that would make it possible to guarantee the free exercise of the right to vote.

### **Election Technology Law in Kenya, 2013–2017**

Election technology law in Kenya is embodied in sections 6A, 44 and 39 of the Elections Act (as amended in 2016) and section 44A of the Elections Act (as amended in 2017), as read with article 86(a) of the Constitution, which requires the electoral system to be simple, accurate, verifiable, secure, accountable and transparent. In *IEBC v Maina Kiai and 5 Others* (Civil Appeal No 105 of 2017), the Court of Appeal expressed the view that the purpose of using of information technology is to guarantee the accuracy and integrity of the results of elections. The court stated (at 70–71) that:

We are satisfied that the electronic transmission of the already tabulated results from the polling station is a critical way of safeguarding the accuracy of the outcome of the elections ...

Section 6A(3)(b) of the Elections Act (as amended in 2016) requires the Electoral Commission to publish the Register of Voters online and in such other manner as may be prescribed by regulations. Under section 38A of the Elections Act, the total number of registered voters per polling station should not exceed 700. The definition and contents of the Register of Voters, as per section 4 of the Elections Act, must be borne in mind. Under this section, the Principal Register of Voters comprises:

- (a) a poll register for every polling station;
- (b) a ward register for every ward;
- (c) a constituency register for every constituency;
- (d) a county register for county, and
- (e) a register of voters residing outside of Kenya.

The requirement to publish the Register of Voters online puts to rest the incessant arguments over where the Register of Voters can be found. The online register is critical in an election petition, particularly where an allegation is made that the number of votes cast exceeded the number of registered voters.

### **What are Common Expectations on which Electoral Technology could Actually Deliver?**

Two important benefits are directly related to the elimination of human intervention in the counting and, in some cases, also the tabulation phase. The first is that the automation of counting and tabulation leads to the expeditious delivery of election results. This is a particularly useful solution when manual counting procedures are

rendered inefficient by multiple contests and complicated electoral formulae. Other advantages are:

1. The elimination of some avenues of fraud: less human intervention also leads to fewer opportunities for fraud by manipulation during counting and tabulation.
2. Some e-voting systems can warn of voters who are about to cast invalid votes; by giving them a chance to correct this, they can reduce the number of spoiled and invalid votes. This applies especially to e-voting in the form of Internet voting that allows voters to cast their ballot from anywhere without the time and locational constraints of polling stations.
3. Providing better services to citizens and offering more convenience for voters can possibly lead to increased participation and turnout. Automation could also simply fulfil an expectation in a citizenry used to more governmental services being provided online.
4. Internet voting is also an example of an e-voting system that can making elections more accessible to some citizens:
  - home-bound or institutionalised voters can be reached more easily;
  - some voting machines have audio interfaces for blind voters;
  - there may even be options for providing ballots in more languages than what is logistically feasible in paper-based elections.

### **Biometric Technology in Somaliland**

The voter registration process in Somaliland in 2008/2009 was framed mainly by the Voter Registration Law 2007 (Law 37 of 2007), as amended in 2008. In this legal framework, the new technology has not been mentioned much. Article 8 indicates that the registration form should include the picture of a registrant and their name, birth year, birth place, gender, the name of the polling station assigned, signature, registration number, reference number, and registration card number. Fingerprints were added in the amendment, in Article 3b, which requires that

using laptop computers, the officers of the National Electoral Commission shall record the relevant details of the registrant, as set out in Article 8 of the Voter Registration Law, and shall also take an electronic scan of the finger print of the registrant, which shall be saved in the computer.

In addition, the provisions of the technical committee that was formed to prepare and complete technology-related matters for the voter-registration process were included in Article 36 of the Voter Registration Law. This article defined the formation, objective, term and duties of the technical committee.

## Global Election Standards

These standards, drawn up by International IDEA (Reynolds, Reilly and Ellis 2005) and various international, regional and UN declarations, conventions on human rights and other relevant legal instruments. The more important of these instruments include the following: the 1948 Universal Declaration of Human Rights; and the 1981 African Charter on Human and People's Rights (AUC 2002; Reynolds, Reilly and Ellis 2008; Norris 2011a; 2011b; 2013a; 2013b). These standards are intended to be used as benchmarks to assess whether an election is free and fair. They are:

- **Participation of women, minorities, marginalised groups, media, civil societies and internally displaced people:** Elections cannot be free and fair unless freedom of information is secured and the media are allowed to operate without undue hindrance. EMBs are expected to establish procedures and bodies designed to regulate the media, provide greater freedom to the press and promote equality of access (AUC 2007; Thomas and Gibson 2014).
- **Constituency delimitation:** The international norm of equal suffrage should be respected when identifying electoral districts and boundaries. There should be fair constituency delimitation procedures that will take into account a range of information, which may include available census data, territorial integrity, geographical distribution and topography, among other data. The polling stations should be distributed in such a way as to guarantee equal access to stations in each constituency (IDEA 2006; Vickery and Shein 2012; IDEA 2014a; 2014b).
- **Voter registration:** In some countries the electoral legal framework requires voter registration to be linked to a national identification or civil registration system that is controlled by an authority other than the EMB. Countries that have used this method include Colombia, Hungary, the Netherlands, Romania and Sweden (Evrensel 2010).
- **Registration and funding of political parties and registration of candidates' nomination:** In terms of the electoral legal framework, the registration of political parties, when required, may also fall outside the functions assigned to EMBs. In countries such as India, Mexico, South Africa and Thailand, the EMB administers political-party registration, serves as the guardian of political-party symbols and independent candidates' logos, and holds copies of party constitutions and selection rules (Institute of Security Studies 2002; Norris 2011a; 2011b).
- **Election campaigns:** Political party and candidate campaign codes of conduct may be included in the legal framework, as is done in Angola, Lesotho, South Africa and Nepal. Alternatively, they may be an EMB-brokered voluntary arrangement between parties, as in Cambodia, India, Indonesia, Kenya, Liberia, Malawi and Nigeria (IDEA 2014a; 2014b; Norris and Grömping 2017).
- **Voter education and information:** Voter information and broader democratic or civic education is a role that is increasingly being added to EMBs. Some EMB legal frameworks have clearly provided for EMB conduct of voter information and



education campaigns. This is the case in Bhutan, Cambodia, Kenya, Latvia, Lithuania, Singapore, South Africa, Thailand and Tonga. In other countries, including Sweden, this is not the case. Some EMBs have a wider remit to promote democratic values (eg Costa Rica), the democratic process (eg Lesotho), the purpose of elections (eg Ghana) and active citizenship (eg Costa Rica) (IDEA 2014a; 2041b; Norris and Grömping 2017).

- **Validation of election results:** It is common for electoral legal frameworks to make EMBs responsible for certifying and announcing election results, and to prescribe a period within which the results must be announced. This is the case, for example, in Armenia, Cambodia, Honduras, Poland and South Africa. In Niger these functions are given to the Constitutional Court and in Cameroon and France to the Constitutional Council. In Denmark, the legislature is responsible for validating the results of national elections. The Chief Justice of Zambia is the returning officer for a presidential election and is therefore responsible for announcing its results (*General Elections Reference Handbook* 2009; Howard 2010; Goldsmith and Ruthrauff 2013a; 2013b; IDEA 2014a; 2014b).
- **Electoral observation:** While independent election observation, by its nature, is conducted outside of EMB control, electoral legal frameworks often assign observation-related functions to EMBs. It is good practice for an EMB to accredit observers, guarantee their rights of observation, provide them with comprehensive background briefing materials and define observers' responsibilities, often in a legally enforceable code of conduct (*General Elections Reference Handbook* 2009; Howard 2010; Goldsmith and Ruthrauff 2013a; 2013b).

### **Electronic Voting-System Experiences Worldwide**

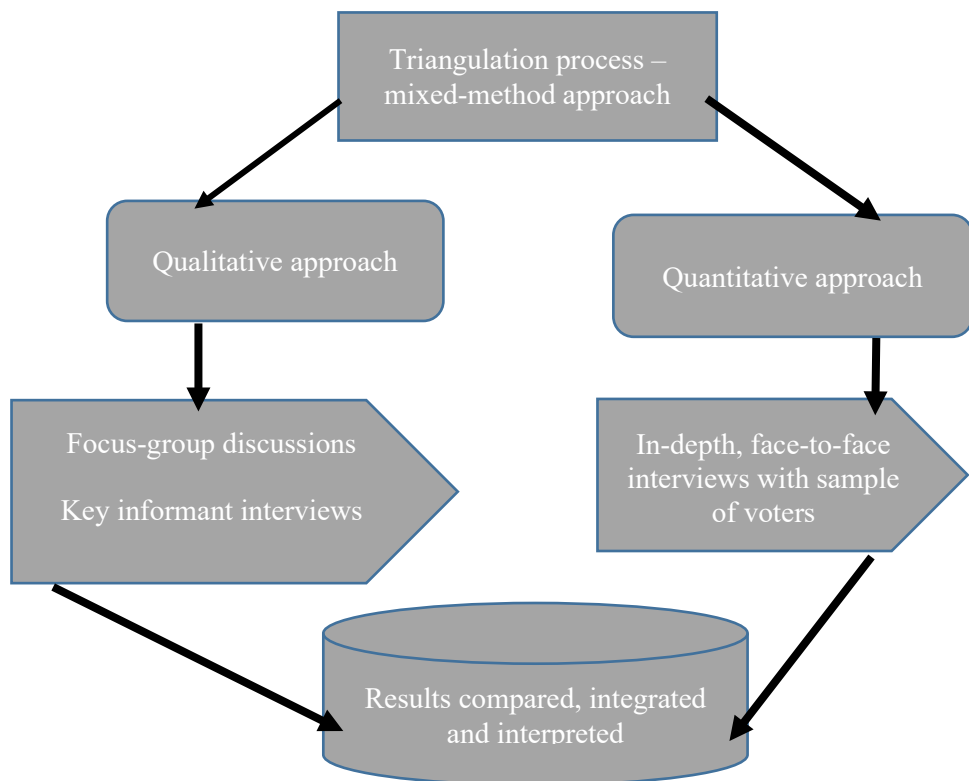
Because of the many benefits inherent in e-voting systems, several countries have since introduced e-voting solutions: either as a pilot system or in its entirety. Countries that have tested and found e-voting to be satisfactory include Brazil, Canada, Estonia, India, Geneva, Namibia, the United Kingdom and the United States. E-voting is also being piloted in a number of African countries: Ghana, Kenya and Nigeria (Enguehard 2008; Gibson and McGaley 2008; Jaleel 2013; Thakur 2015). Table 2 below presents a summary of countries' experiences with e-voting.

### **Methodology**

The qualitative methodology used involves desk research; project scoping and the development of an inception report; focus-group discussions with voters, and key informant interviews with relevant stakeholders working directly and indirectly with the IEC-SA and stakeholders' validation workshops. The quantitative interviews involved in-depth interviews with voters to determine the rationale behind the use of technology for elections.

The information was gathered by an online search of the secondary academic literature

on electoral-system management, published reports, legal mandates and official websites of the EMBs considered in this study. The lessons of the past decade show that technology has great potential for strengthening electoral integrity, but its introduction and use must be grounded in well-designed policies, underpinned by adequate safeguards and supported by legislation that is adequate to deal with the issues that technology raises. Some of the official documents may not provide complete or current information and may not provide frank evaluations of performance; interviews were therefore sought with senior election officers in three SADC countries: South Africa, Lesotho and Namibia. The IEC of South Africa and EISA were used to identify contacts and to obtain agreement for the interviews. Semi-structured interviews were conducted with officials from these EMBs on a confidential, not-for-attribution basis.



**Figure 3:** Triangulation process (Johnson, Onwuegbuzie and Turner 2007; Lacey and Luff 2007; Bryman 2013)

## The SADC Experience of Technology Adoption in Elections

As at 2019, only three SADC states have made use of electronic technology in the administration of elections: South Africa, Lesotho and Namibia. The experience in each of these countries is now discussed.

### Elections in South Africa

Elections in South Africa are administered by the Independent Electoral Commission (IEC), which manages every part of the elections in order to ensure that they are credible, free and fair (IDEA 2014a). The IEC was temporarily formed in 1994; it was permanently entrenched in 1998 in terms of the Electoral Commission Act 51 of 1996. The responsibilities of the IEC are clearly described by Masuku (2006). These include managing national, provincial and municipal elections, although it is suggested that the work of the IEC extends beyond the administration of local, provincial and national elections. It also works with and mediates between political parties, adjudicates disputes, promotes voter education and reviews electoral legislation. The IEC has responsibilities and duties that need to be met in order to attain free-and-fair elections, as stipulated by the Constitution and the Electoral Commission Act 1996 (IEC-SA 2014; Mpekoa 2017).

In order to give legitimacy to elections, the South African Constitution, 1996 guarantees the independence of the IEC as an autonomous body; and it restrains other government bodies from interfering with its functions. The IEC is accountable to the National Assembly – even though it is an independent body (Booyesen, 2005). In addition to the Constitution, several Acts define the structure, powers and duties of the Commission. They provide regulations for the administration and all other issues related to national, provincial and municipal elections. Two of these Acts are:

- The Electoral Act 73 of 1998, which provides further regulations regarding the operation of national, provincial and municipal elections. It is often described as the instruction manual for elections (IEC-SA 2014; Mpekoa 2017).
- The Local Government: Municipal Structures Act 117 of 1998 deals with the establishment, management and functions of the various municipalities, and also the seat calculation formulas (ie conversion of votes into council seats) (IEC-SA 2014; Mpekoa 2017).

### *Election Facts and Figures*

According to the IEC reports (1994; 2004; 2009; 2014), the population of South Africa increased from 40,42 million in 1994 to 46,60 million in 2004 and 54 million in 2014 (see Table 2 below). The IEC also reported that, in 2014, out of an estimated voting-age population (VAP) of 31,4 million, 25,3 million voters had registered, of which 2,3 million were newly registered. Voter registration has increased in numbers; but when

the figures of 22,7 million, 20,67 million and 23,18 million in 1994, 2004 and 2009, respectively, are compared, these numbers are not very impressive (IEC-SA 2014; Mpekoa 2017).

### *Use of ICT in Election Process*

For decades, running an election has been a manual and work-intensive operation. Gradually, ICTs are being introduced into various aspects of the election process. The use of modern ICT to simplify the administration and to increase cost-effectiveness is slowly increasing all over the world, even in countries not officially exploring e-voting implementations (Achieng 2014). These technologies (eg back-end computer systems, optical readers) have been introduced for voter registration, voter-list generation, voter authentication, the counting of votes and the tabulation of results, as well as their transmission electronically. This recent development indicates that e-voting is irreplaceable in our technologically oriented society, where an increasing number of processes are mapped into the electronic world (IEC-SA 2014; Krimmer 2012; 2014).

The current South African paper-based voting process has a number of technological aspects to it. At the core of the IEC's ICT capability is a continuous support service that provides the foundation for all other ICT activities (IEC-SA 2014). These services include:

- stable applications to support and enable all business processes;
- closely integrated systems that ensure a seamless flow of information across the different systems;
- a stable and secure ICT infrastructure, a stable network at the levels of both wide-area networks (WAN) and local-area networks (LAN), and at the data centres;
- scalable network and background-server capacity, with the required capability of supporting increased election activity and network traffic;
- the management of risks, disaster recovery and business continuity processes;
- integrated online self-service facilities for citizen engagement through the Internet using websites, mobile applications, SMS, unstructured supplementary service data (USSD) and social media;
- stable and effective open platforms that provide an integrated technology-enabled platform for all stakeholders through an application programming interface (API).

The first modern paper ballot was developed in Australia, when it was considered a great improvement over previous systems. The paper-based voting system was introduced in South Africa at Union in 1910 (Southey 2001; Habib and Naidu 2006; Alvarez et al 2010). During this time, every individual was classified according to race and only three languages (English, Dutch and Afrikaans) were the official languages in the country. African, Indian and Coloured voters were removed from the common voting roll in 1936 – except in the Cape and Natal, where qualified Africans could vote

only for white native representatives (Mouton 2005; Beck 2013; Nupen nd). The statistics then showed that the population of the country was 5,8 million (Khosa and Muthien 1998; Booysen 2009) and the paper-based voting system used worked very well in that situation, as the number of the voters was relatively low and manageable.

Currently, South Africa has a population estimated at more than 56,72 million (Statistics South Africa 2017) and 11 official languages are recognised in the Constitution for administrative, governmental and legislative purposes. The South African Government legally recognised equal rights for all South African citizens in December 1993 (Deegan 2014), a measure that has given every adult the opportunity to participate in national elections.

In April 1994, the country had its very first democratic election, which employed the very same traditional paper-based voting system; this was followed by the 1999, 2004, 2009 and 2014 elections (Beck 2013; Thakur 2015). Meanwhile, the number of voters, representing all the country's official languages, has increased dramatically – to such an extent that managing the voting process has become both complex and traumatic (Enguehard 2008).

This system opens up the possibility of voter influence, persuasion, bribery and coercion occurring, which jeopardise the voting process (Thakur and Singh 2012). This system was considered advantageous at the time, as it made elections involving a large number of voters easier to run. It also provided secrecy to voters when casting their votes. This is the same system that was used in South Africa in 2019. This system was suitable for South Africa back in 1910, as the population was manageable and only three languages were then the official languages in the country. Now, with the current population and number of official languages, it is no longer practicable or sustainable.

The weaknesses of the paper-based voting system include:

- potential for election fraud;
- low voter literacy;
- voter disenfranchisement;
- voters with disabilities not being accommodated;
- some South Africans living abroad not being accommodated;
- the high cost of running elections;
- the low levels of competence of election officials;
- logistical problems (delivery of materials to voting stations, vote counting, etc);
- intimidation and impeding of voters, and
- human error.

## **Lesotho Independent Electoral Commission**

The IEC was established in 1997 as a body responsible for managing elections. It is made up of a three-person Commission and a Directorate. The Commission consists of the chairperson and two commissioners: this structure is mainly responsible for policy-making and oversight. Each commissioner is appointed by the king to serve a maximum of two three-year terms. In appointing the IEC, the king is advised by the State Council and selects the prospective commissioners from a list of no fewer than five names that are jointly nominated by all registered political parties. The commission is empowered to organise credible, fair and impartial elections for the National Assembly and local government as well as referenda in line with the Electoral Act 1992 and the Constitution of Lesotho. The Commission's main responsibilities include:

- registering electors;
- supervising the preparation, publication and maintenance of a general register of electors;
- registering political parties;
- demarcating constituency boundaries;
- conducting elections.

Voter registration in Lesotho is mandatory and a continuous process. The National Assembly Electoral Act Amendment 2 of 2011 gives the IEC powers to suspend the registration of voters during the elections only. The Act provides that the IEC, through the office of the Director of Elections, must prepare and display the list of registered voters 30 days in advance of the voting day. The voters' roll is displayed publicly in two phases, namely, the provisional list and the final list. The IEC network infrastructure covers a wide area and exploits a number of different technologies. The branches are connected to the IEC headquarters' data centre through WAN technologies. It is estimated that the IEC had approximately 150 users on its network, spread throughout the remote locations. It is important to note that the majority of users are based in the Maseru district, the capital of Lesotho. The ICT service includes biometric technology to support voter register GIS, Internet connectivity and email facilities. The final product of a voter register is the voters' roll in the form of a report based on SQL server and other modern platforms. Voter details are collected directly from the constituency villages to the district and are then uploaded to the IEC data centre.

## **The Namibian Experience**

Africa saw its first nationwide use of e-voting during the presidential elections in Namibia. For this purpose, the Electoral Commission of Namibia (ECN), which is responsible for organising and conducting elections in the country, purchased 3 400 electronic voting machines (EVMs) from India. These machines were developed and designed specifically for the electoral process in Namibia. The EVMs were introduced

by the ECN in order to overcome some of the shortcomings of the previous electoral system.

The EVMs have two components: the control unit (CU) and a ballot unit (BU), and each records a maximum of 3 840 votes. The EVMs have a controller that has its operating program engraved permanently in a silicon chip at the time of manufacture. No person, including the manufacturer, can change the program once the controller has been manufactured. For voting purposes, the Presiding Officer, or a Polling Officer, retains the CU during elections, while the BU is placed inside the voting compartment for the voters to use. Rather than issuing a ballot paper, the Presiding Officer in charge of the CU pushes the ballot button to enable the voter to cast their vote. The voter, in turn, pushes a button on the BU against the name of the candidate and the symbol of their choice. After the last voter has voted, the Presiding Officer pushes the 'Close' button. After that, the EVM will not acknowledge any further votes. The BU is then disconnected from the CU and stored separately. The EVMs do not provide a paper trail of the votes cast.

The new voting system was rolled out as follows. The ECN conducted intensive training on the use and operation of the EVMs across all 13 regions in 2013. Mock elections were organised and implemented at which the ECN targeted small locations and tertiary institutions – both to ensure its smooth working and to familiarise people with the new operation. The machines were then used in by-elections to prepare for the roll-out on a national scale for the 2014 elections. The ECN also exhibited the machines at the Windhoek Show in 2012, providing members of the public with an opportunity to view the machines for the first time. All these initiatives were intended to prepare all the election stakeholders for the nationwide use of EVMs (Idris and Yusof 2015; Thakur 2015; Mensah 2016).

## **Important Lessons from African Democracies**

A number of key lessons have been learned about conducting free-and-fair elections. According to Juma (2017), the first lesson relates to the political will. Since 1991, Somaliland has operated as an autonomous state trying to build new institutions. One of its central goals is to gain international recognition as a sovereign state. Being able to conduct free, fair, credible and just elections is central to this goal and the state's international image. Somaliland wants to rank highly in the indices of democratic performance – it is no small undertaking to develop and embrace electoral practices that are in line with international standards.

The second lesson involves problem-solving and incremental technological learning. Somaliland wanted to reduce voter duplication. Accordingly, it compared the efficacy of different face-, finger- and iris-recognition technologies, and this assessment showed that iris recognition was superior (Chan 2017; Juma 2017).

Thirdly, it is no longer enough to have a protocol that says paper votes have to be placed in clear-plastic ballot boxes. Election stakeholders – including observer groups, non-governmental organisations (NGOs), civil society, voters, political parties, the legislature, security agents and the judiciary – all need to know not only how the system works, but also how it cannot be made to work in ways that do not reflect the electorate’s will. Electoral commissions need to open up all stages of the electronic process to knowledgeable observers, and especially the verification stage. This is where subtle algorithmic adjustments can be inserted to preserve close parity between voting patterns on the ground and “verified” results that “just” deliver very narrow victories to a ruling party (Chan 2017; Juma 2017).

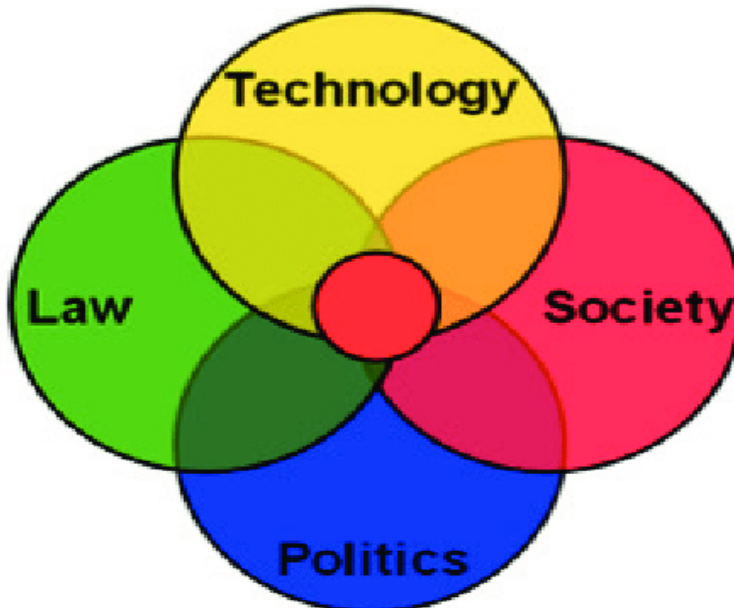
Somaliland has become the first country in the world to use iris recognition in a presidential election. This means that a breakaway republic seeking international recognition will have the world’s most sophisticated voting register. In South Africa, robots play a crucial role in mining and other industries, so the question arises why the country cannot introduce a sophisticated voting system. Some African democracies are in the process of co-ordinating a generation jump in applied technology. So far, they have actually done a remarkable job by global standards. The African Union and other regional bodies now need to devise a standard set of requirements and attributes for electronic voting across the continent (Chan 2017; Juma 2017). Some suggestions for devising and standards are set out in the next section.

## **Elections and a Technology Model (Multiple-criteria Decision Analysis)**

### **Analysis of the Social and Economic Context**

Some of the benefits of using IBTs include offering mobility and providing efficiency to voters, which means achieving critical wide social acceptance (Cammaerts 2008). Socio-economic factors integrated into the proposed IBTS framework include the acceptance and adoption of technology; mobile-phone use; the cost of voting, the digital divide, and trust (Mpekoa 2017). To analyse the socio-economic impact, it is imperative to consider social, political, economic and community influences. The dimensions are illustrated in Figure 4. The study also categorised IBTs’ critical success factors in the implementation process in these four dimensions, as proposed by Prosser and Krimmer (2004).





**Figure 4** Critical success factors in the implementation electoral technology solution (adapted from Prosser and Krimmer 2004)

### *Politics*

In this area, it is necessary to know which political system is used (eg constitutional monarchy, parliamentary democracy, etc), the method and frequency of elections as well as general statistics on elections (eligible voters, electoral districts, the number of polling stations). The second important point for politics is the official attitude towards e-voting. The stages in the policy-making process are relevant, as are the aim of the policy and the official organisation planned for e-voting implementation (perhaps even integrated into an e-government organisation) (Prosser and Krimmer 2004). According to Krimmer and Schuster (2008a; 2008b), several factors exist in the e-democracy environment, especially in the political context of stateliness: the rule of law, the stability of democratic institutions, the election system and voter turnout, political participation and political aims. These factors are very important for successfully implementing e-voting.

### *Law*

The prevailing legal system is the key element of law, with the special electoral law as the basis of the technological solution. For e-voting, the existence of legal principles as the basis of elections is important, as is the way e-voting is (or could be) implemented and the stage at which e-voting is in the legislation-making process (Prosser and

Krimmer 2004). The legal aspects are used to measure whether the required basics of democratic elections have been satisfied (Krimmer and Schuster 2008a; 2008b).

### *Technology*

It is important to know the status of voter registers in general, especially the register of citizens and, as a subgroup of that, of eligible voters. Further important technological infrastructure considerations are the implementation of a digital national identity (ID) card and a digital signature, and whether the adoption of international e-voting standards is planned. Furthermore, it is of interest to know the level of e-government offerings in general (Prosser and Krimmer 2004). Technology therefore becomes a prime mover in improving the quality of urban life for citizens and in this way it sustains renewed urban growth (Dameri 2014). With the implementation of a cyber political system, the media are needed to mediate between citizens and the state, including the use of information technology and digital communication by government and civil society (Krimmer and Schuster 2008a; 2008b).

### *Society*

The social factors concentrate to the level of political participation, the turnout for postal voting and the public attitude towards new technologies and e-voting in particular. It is also necessary to know the penetration rate of telephones, mobile phones, personal computers, the Internet (including broadband access) and, finally, Internet transactions in society (Prosser and Krimmer 2004). According to Krimmer and Schuster (2008a), several factors exist in an e-democracy environment, especially in the information society context:

- the status of registers;
- the status of e-government infrastructure and of the digital net infrastructure;
- the cost of entry to information and communication services and of the use of services;
- the diffusion of information and communication services;
- expenditure on information technologies and information- and communication-referred services;
- transaction penetration, and
- the degree of informatisation in the public administration; included in this dimension are items such as computer and Internet penetration (Prosser and Krimmer 2004; Vinkel and Krimmer 2016)

### *Multiple-criteria Decision Analysis*

Making a strategic decision about whether technology should be used at all levels of elections in southern Africa is close to becoming a reality. Strategic decision-making usually involves uncertainty, requires a large number of resources and has long-term

consequences (Higson, Ho and Dey 2006). For these, the essential decision-making tools presented above can help with depicting all the alternatives and their consequences. The model presented in this section proposes multiple-criteria decision analysis (MCDA) as the way to help governments making the decision whether the country should use e-voting technology in its presidential and general elections. The model was developed based on the decision theory (Dodgson, Spackman, Pearman and Phillips 2009), which was modified to integrate multi-attributed consequences. Dodgson, Spackman, Pearman and Phillips (2009) further define MCDA as a technique that aims to generate a range of available decision-making scenarios. MCDA sees big problems as sets of smaller and simpler problems that enable uses of partial data and support partial decision-making processes. The model then integrates the partial decisions to generate a complete and more comprehensive picture of the problems and solution scenarios. Belton and Stewart (2002) have put forward four properties that further explain the definition of MCDA:

- it explicitly involves multiple criteria;
- it helps management to make decisions;
- it provides a model that categorises scenarios of solutions based on defined multiple criteria;
- it offers an approach to generating strong arguments while making a rational decision.

Moreover, Mendoza and Martins (2006) have suggested that MCDA can be used to solve complex problems, for two reasons. First, it supports the use of both quantitative and qualitative data, including the opinions of experts. This is very useful in situations where quantitative data are incomplete, unreliable or hard to understand, such as with previous elections in some SADC member states. Secondly, it supports collaborations between experts and stakeholders towards making a decision (Dodgson, Spackman, Pearman and Phillips 2009).

## **Conclusion**

The SADC needs to conduct a thorough study before deciding whether to implement a regional technology framework in general elections held in its member states. This article proposes a multi-disciplinary research mode in which critical success factors in the implementation are reviewed, are capable of identifying election problems, are able to assess the country's readiness to implement the new technology, and can generate a standard and framework for implementation. In the end, introducing the technology to support free-and-fair elections would have a positive impact on the SADC region and the entire continent.

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