INNOVATIONS FOR
SUCCESSFUL SOCIETIES

REBOOTING THE SYSTEM:
TECHNOLOGICAL REFORMS IN NIGERIAN ELECTIONS, 2010 - 2011

SYNOPSIS

In 2010, President Goodluck Jonathan appointed committed reformer Attahiru Jega to chair Nigeria's electoral commission, building hope that the West African nation would finally break its chain of discredited elections. With under a year to prepare for the April 2011 elections, the commission turned to emerging technologies such as open-source software and social media to register 73 million voters from scratch and open a direct dialogue with the electorate. A small team of young Nigerian engineers guided by Nyimbi Odero pioneered these innovations, many of which contradicted the advice of elections experts. Despite some initial technical difficulties, Nigeria's homegrown technology enabled the commission to prepare for elections goals on schedule and under budget. The credibility the commission earned helped spur unprecedented levels of voter participation. Ultimately, domestic and international observers validated the 2011 elections as the most free and fair in Nigeria's history.

Gabriel Kuris drafted this case study on the basis of interviews conducted in Abuja and Lagos, Nigeria, in October 2011. Case published March 2012.

INTRODUCTION

Although quickly fixed, the technological glitch was so embarrassing it made international news. "Former president's fingerprints trip up Nigerian voter registration machines," read the CNN.com headline, accompanied by a picture of Olusegun Obasanjo comically throwing his hands up in resignation after Nigeria's voter registration system rejected his fingerprints.[1] With tensions high and television cameras rolling, the public debut of the new voter registration technology turned into a public relations disaster for Nigeria's Independent National Electoral Commission (INEC).

Obasanjo took the malfunction in stride,

calling it a "hiccup in the process." But the hiccup proved contagious. On the first day of registration, 15 January 2011, voters across the country reported difficulties. When the machines failed to recognize the fingerprints of Senate President David Mark and his wife, he told the Nigerian newspaper *Next*, "INEC must put its house in order … We cannot afford anything that would threaten the conduct of the forthcoming elections. INEC must sit up and save us this embarrassment."[2]

In Nigeria's third national election since military rule ended in 1999, a failed voter registration process could potentially have disastrous consequences. Domestic and

international observers had widely condemned the 2003 and 2007 elections as severely flawed.[3] Another failed election would undermine Nigeria's international standing and threaten foreign aid. The 2011 elections also divided Nigerians along religious and ethnic lines. If voters didn't trust the process, they were more likely to turn to violence.

In this high-stakes environment, INEC gambled on cutting-edge technologies to complete voter registration accurately and on time. Supported by the commission's new chairman, Attahiru Jega, this effort was executed by a team of young engineers led by Nyimbi Odero. Against the recommendations of international observers and industry experts, Odero's team jettisoned standard electoral technologies and built new tools based on open-source software.

Within days, Odero's team fixed the glitches and put the voter registration process back on track, ready to handle an unprecedented flood of registrants. The electoral commission began to communicate more directly with the electorate, using social media and mobile technologies pioneered by youth activists. By the time balloting began, such technologies helped INEC turn each citizen into a watchdog against fraud. Through cost-effective homegrown technological solutions, the electoral commission showed the world Nigeria's capacity not only for democracy but also for technological innovation.

THE CHALLENGE

In 2010, Nigeria was the world's seventh-most populous country, encompassing many contradictions. Although it possessed the world's 10th-largest estimated oil reserves, Nigeria's weak infrastructure and power shortages had stunted development.[4] The country had a reputation for poverty and corruption, yet it also featured a sophisticated and growing economy, including Africa's largest entertainment industry and

second-largest stock exchange. Despite a dense network of civil society organizations, Nigerians were deeply divided along religious and ethnic lines and threatened by outbursts of violence. With all these elements in play, elections tended to be contested, controversial and combustible.

The country's 1999 constitution, which restored civilian government after 16 years of military rule, assigned the electoral commission responsibility for ensuring the fair, free and safe conduct of elections. The elections of 2003 and 2007, marred by violence and denounced by observers for rampant fraud, undercut the commission's credibility. In turn, INEC pointed to its own institutional constraints, such as lack of financial independence. These elections perpetuated Nigeria's reputation for corruption and lowered the country's international standing. When U.S. President Barack Obama made a high-profile visit to nearby Ghana in 2009 to highlight its "democratic commitment" as a model for Africa, Nigerians perceived a pointed snub by their largest aid donor and trade partner.[5]

Eager to boost its democratic credentials at home and abroad, the government of Nigeria enacted two electoral reforms in 2010. In June, President Goodluck Jonathan appointed to INEC's powerful chairmanship Attahiru Jega, vice chancellor of Bayero University, Kano. Jega had a reputation for both scholarship and political engagement, having served as president of the Academic Staff Union of Universities and as a member of the Electoral Reform Committee convened by Jonathan's predecessor, Umaru Yar'Adua. In August, the National Assembly implemented some of the recommendations of the Electoral Reform Committee through the 2010 Electoral Act, including the creation of a separate INEC fund that freed the commission from the requirement to secure presidential approval of its budgetary requests. The legislature also granted INEC an operating budget of 87.7 billion Naira (US$550 million), close to Jega's request and 60%

higher than its 2007 election budget of 54.5 billion Naira.

These reforms and the appointment of Jega encouraged Nigeria's electorate and civil society to trust INEC. "From all my interactions with him, I knew that Jega was honest about delivering credible elections," said Clement Nwankwo, a longtime civil society activist and founder of the Policy and Legal Advocacy Centre. "Overall, people respected him and his integrity and felt he was doing things right."

However, the public trust that buoyed Jega could prove fickle. "On the one hand, he had very high expectations, coming from the public," said Kole Shettima, a Nigerian political scientist who directed the Africa Office of the U.S.-based MacArthur Foundation. "At the same time, he was dealing with an institution that he inherited that had its own traditions [and a] reputation for corruption, for bureaucracy, for doing the wrong thing historically."

The commission's Information and Communications Technology (ICT) Office shared this poor reputation. According to Shettima, "The ICT section of INEC was totally, totally corrupt." Responsible for awarding and overseeing lucrative procurement contracts, the ICT office had experienced scandals over kickbacks and patronage schemes. Because the size of kickbacks increased proportionally with the value of contracts, officials had little incentive for cost control. As Shettima put it, "Their passion is always to buy things."

Accordingly, Jega put particular emphasis on reforming how INEC procured and used technology in the 2011 elections and enlisted the help of advisers who understood the importance of information technology (IT). Chief among them were: Professor Okey Ibeanu, INEC's chief technical adviser; Professor Muhammad Kuna, special assistant to Jega; and Nyimbi Odero, who managed INEC's technical preparations for voter registration. These three officials collaborated

closely to drive technological reforms. Ibeanu and Kuna provided high-level support to overcome institutional resistance to innovation, while Odero, in Shettima's words, was "the techie."

Born in Kenya in 1971, Odero had emigrated to Nigeria and described himself as "fanatically Nigerian." As leader of Google Inc.'s office for Anglophone West Africa, Odero worked to demonstrate the value of Internet connectivity for local users. In August 2010, Odero walked into INEC's technology office looking for data on polling places for a Google project. He saw how overwhelmed the office was by Jega's determination to build a new voter registry within three months. Listening to how INEC approached the challenge, Odero said, "It occurred to me, 'By golly, this isn't how it's done.'" The commission asked him to assist on a full-time basis. Motivated by the national implications of the challenge and fascinated by its scale and complexity, he resigned from Google at the start of September to assist the commission, with funding support from the United Nations Development Programme (UNDP) and the Ford Foundation.

At the time, the commission was boxed in by a constitutional provision that mandated elections in January 2011 and required INEC to prepare a voter registry by November. The government supported Jega's call to delay the election until April and the National Assembly passed the required amendment in August, but in November the courts ruled it invalid for procedural reasons. A valid amendment passed in early January 2011, with a voter registration deadline of mid-February. Until then, however, the electoral commission worked under an uncertain timeline.

Besides these time limitations, Odero said, "A whole bunch of political, economic, technical, procedural challenges emerged." INEC "didn't have the equipment, the plan, or the software" to compile a new list, and he described the equipment used in 2007 as "defunct, obsolete, and

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totally unusable." Within a tight budget, INEC had to design and procure a wholly new system to capture and store voter information and ensure this registry was secure, errorless and election-ready.

Moreover, completing a new voter registry was only one pillar of a larger project: building the trust of the Nigerian electorate. The electoral commission had to overcome its poor reputation by demonstrating integrity and competence. It had to convince the public that it was using its financial independence and enlarged budget responsibly, transparently and cost-effectively. And ultimately, it had to hold elections with results accepted by all parties and validated by international observers. If voters turned against INEC, they were more likely to boycott polls, distrust official vote tallies, and turn a blind eye to fraud. Such conditions increased the risk of mass violence.

If they trusted INEC, motivated voters could help fight fraud. By mid-2010, the elections were already generating high voter interest. The Congress for Progressive Change (CPC) led by Muhammadu Buhari, a pious Muslim and former military ruler running on an anti-corruption platform, posed the first serious challenge to the ruling People's Democratic Party (PDP) in a decade. Previously disengaged citizens, especially the youths who constituted nearly three-quarters of Nigeria's population, reacted strongly to Jega's commitment to reform and engagement of civil society.[6] Activists who had previously castigated INEC now supported the commission's new direction.

Voters manifested their excitement online, reflecting the dramatic rise of information technology in 21st century Nigeria. By 2011, out of an estimated population of 155 million, Nigeria had 87 million owners of mobile phones, 44 million Internet users, three million Facebook profiles, more than one million smartphones, and 60,000 Twitter accounts.[7] Nigeria's Internet

penetration rate of about 28% was the highest in mainland sub-Saharan Africa.[8] Still, election observers were shocked by social media's tremendous impact. "Yes, there's a huge digital divide," said Jens-Peter Dyrbak, a governance adviser for Britain's Department for International Development, "but social media played a much bigger role [in the 2011 elections] than I would have thought."

Youth protest movements in early 2010 had already demonstrated social media's potential to motivate offline activism. One such group, Enough is Enough, organized rallies in the cities of Abuja and Lagos protesting government inaction on corruption, joblessness and electricity shortages. Celebrities publicized the gatherings and thousands attended. "It wasn't like we woke up one morning and said we wanted to start a youth movement," explained Amara Nwankpa, a young IT professional and one of the group's founders. "We just found ourselves in a situation where no one else was doing anything. … It was a shock realizing just how much power we had to mobilize opinions from our generation."

At its height, "Enough is Enough" became the top-trending topic worldwide on Twitter's popular social media platform, attracting interest from Nigerians worldwide. Because of this "combination of social media with on-the-street action," Nwankpa said, "the government began to listen." INEC reforms were among the movement's demands.

"When Jega was appointed," Nwankpa said, "we saw an opportunity to work with him. We were looking for a partnership with INEC and with other civil society groups, to work together and in the same direction." Eventually, youth activists like Nwankpa would prove to be powerful allies against fraud and disinformation. First, however, INEC had to focus on voter registration.

FRAMING A RESPONSE

The easiest way for INEC to meet its initial

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November deadline for voter registration would have been to update the voter registry used in the flawed 2007 election. However, Odero said, "There was a general consensus across the nation that the old voters' registry was unacceptable. It was patently, obviously unacceptable. We had thousands of people called 'Michael Jackson.' A very large number called 'Nelson Mandela.'" The list included Hollywood actors and fictional characters, sometimes with pictures. Thus, against advice of some international experts, Jega in July had publicly committed INEC to building a new registry, which Shettima described as "the litmus test for the election" for Nigerians.

Because Nigeria lacked a national identification system, Jega reasoned that registering all voters in person was the only fair way to create a truly comprehensive registry. INEC's technical staff discussed other options, including contracting the voter registration process to wireless network providers or relying on citizen databases collected by contractors working for other government agencies. These options had strong private-sector support and advocates among INEC, but Jega and Odero worried they might disadvantage citizens from marginalized rural communities.

Considering the country's high rates of voter fraud and significant illiterate population, the commission decided to identify registrants by name, age, photograph and fingerprints. To collect these data, INEC leaders created a kit called a "Direct Data Capture Machine" (DDCM) consisting of a laptop, webcam, fingerprint scanner and printer. Each kit also would need an external hard drive for data storage, a long-duration battery for power where electricity was unreliable, and a durable, weatherproof case to protect delicate electronics. Plus, each DDCM required an ample supply of software CDs, printer toner and paper for making ID cards.

Nigeria had 120,000 polling places

nationwide; it would be costly to equip each one with its own DDCM. In some previous elections, INEC had established regional registration centers that served multiple polling places, but this approach confused some voters and slighted rural communities. Jega considered following the model of a recent successful voter registration exercise in Bangladesh—a country roughly comparable in population—in which a mobile team equipped with 10,000 registration kits had moved through the country progressively, registering voters by region.[9] However, Bangladesh's process had taken many months. Thus, INEC decided each polling place should have its own DDCM, plus 10% extra to replace losses from malfunction or theft. This meant 132,000 DDCM kits. "Laid end to end, Odero noted, they "would form a chain over 87 kilometers long."

Odero decided the DDCMs had to meet three basic conditions. First, their technology had to be non-proprietary, unencumbered by intellectual-property claims. Odero wanted freedom to engineer last-minute modifications and hoped to avoid the experience of a government agency that contracted information management to a foreign company and found itself locked out of its database after a payment dispute. Second, they needed to be inexpensive, preferably off the shelf. When buying 132,000 units, Odero noted, "every last cent counts." And third, they had to be easy to operate, to minimize user errors.

With these requirements in mind, INEC contacted the top 100 publicly quoted name-brand manufacturers of computers and fingerprint scanners and asked for quotes. Major foreign manufacturers balked at the technical requirements and short timeline. "IBM and HP said, 'you must be joking, right?'" Odero recalled. With no realistic off-the-shelf options, Odero decided to engineer the DDCMs from scratch and solicit manufacturers to assemble the custom

product.

Odero's team also needed software for capturing voter information and storing it in a database. The software had to be intuitive, secure, inexpensive and hardware-compatible. Odero priced the proprietary software options used at the time by every electoral agency worldwide at US$120 per unit, $15.8 million in total. Private contractors for secure database management quoted a rate of US$2 per entry, $150 million in total. Odero considered these prices exorbitant. "We're not asking for anything complex," he said, just "a long list of people." He ruled out all commercial software options.

Odero's small team could never program this much software from scratch. They sought Jega's approval to rely upon free "open source" software, developed collaboratively by programmers worldwide and released freely online for anyone to use or modify.

Proponents of open-source software believed that the evolutionary process of public feedback and continuous modification would lead to superior programs at little or no cost. However, Odero met strong objections from INEC staffers, industry trade groups and international advisers. "The brouhaha was beyond belief," Odero said. Critics contended that open-source software, rarely used in Nigeria, would confuse poll workers and create compatibility issues with the computer, printer and scanner. They also worried that using freely accessible source code would threaten security of voter information. Above all, they feared that open-source software was untested in electoral conditions. "Local vendors and consultants were up in arms," Odero said. "Members of the international electoral support community were utterly against it. They said, 'Look, this has never been done. It's going to fail.' They made a concerted effort to shoot it down."

In the media, Odero was suspected of secretly working to promote the interests of Google, a claim Odero dismissed as baseless and disingenuous.[10] "Democracy is an extremely expensive and inefficient thing to run," Odero said. "If you bring up new ways that radically lower the cost, it changes the entire dynamic. In a very real way, there was an institutional, intellectual and emotional repugnance at the sea change that was about to happen." Proprietary election technology was a multibillion-dollar global market and free software had the potential to undercut it. The vendors "fought bitterly," he said. "It was an all-out war."

Odero said he was known as "an open-source zealot" because he believed strongly in the unique advantages of the software. First, using open-source programming would save almost US$170 million in fees and licenses. Second, the commission wouldn't have to worry about intellectual-property entanglements. Third, the data would be more secure, since cyber attacks generally targeted the most popular commercial programs. Odero quoted open-source pioneer Eric Raymond's maxim that "many eyes make bugs shallow." Because thousands of programmers worldwide continually reviewed open-source software, vulnerabilities could be detected and corrected promptly, like errors on a Wikipedia page.

Despite the chorus of critics both inside and outside the commission, Odero found that "the people interested in getting the job done" saw the value of the open-source strategy. "Chairman Jega sought to create an environment where logic, rationality and common sense were principal drivers of most decisions, with a complete emphasis on transparency in everything," he said. To Odero, open-source software fit these values. By the end of September, INEC decided to use open-source software for most of its needs.

The stakes were high. "If it didn't work, it was the end of our careers," Odero said. "We'd have to do registration again, we wouldn't have the voters' registry in time, and it would have brought on a constitutional crisis." INEC

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scheduled registration for the last half of January 2011. The law required it to be finished by mid-February.

GETTING DOWN TO WORK

From September to January, Odero's team worked at a frenzied pace to design the DDCM hardware and software, acquire the units, and determine how best to integrate technology into the voter registration process. At the same time, youth activists and everyday citizens were using social media and mobile telephones to whip up voter interest, putting additional stress on the commission. By the time of the election, INEC staff would collaborate with activists to harness voter energy to make voting easier, fairer and safer.

Engineering solutions

Odero's engineering team developed hardware innovations that minimized costs and maximized durability. For example, each DDCM needed a long-life battery because of the unreliability of Nigeria's power supply. In the past, INEC had depended on car batteries with power inverters, which were heavy, inefficient and sometimes unsafe. For 2011, the team decided to equip each DDCM with a lithium ion battery. Because each weighed less than a kilogram, the batteries were easily portable. Most importantly, theoretical calculations and real-world tests demonstrated that each battery could power a laptop, printer and scanner for as long as 14 hours in Nigeria's sunny, balmy climate.

To deter theft, INEC developed a custom BIOS—the basic software that is the first code to run when a computer boots—that displayed the INEC logo and was hard to disable. The INEC logo was also emblazoned upon all hardware components.

For program software, Odero developed a voter registration system called "OpenVR" with a small cadre of volunteers led by Femi Taiwo, a partner at a Lagos-based software firm, assisted by Olusola Ajayi, Ronke Domingo and Fisayo Orimoloye. Odero described the group as "really bright people, very focused and devoted" who did "most of the heavy lifting" while he concentrated on the system architecture. After the election, Jega proudly told the press, "The software used by INEC was developed by some brilliant Nigerians, and this software was done for free."[11]

The OpenVR program ran on Ubuntu, a Linux-based operating system. The database used PostgreSQL, which Odero described as "not hard to program; robust and reliable." Both were open-source.

The software team did not work in isolation. The International Foundation for Electoral Systems and the UNDP provided elections expertise. For technical support, the team consulted with developers worldwide using online forums. Most important, they tapped into one of Nigeria's greatest resources: highly educated members of its far-flung diaspora. "A great many Nigerians both within Nigeria and in the diaspora volunteered expertise, time, and important effort" according to Odero.

For example, Odero's team had trouble calibrating the fingerprint-recognition software. On the Internet, Odero found a Nigerian biometrics expert named Chukwuemeka Ujam based in London and emailed him for assistance. Ujam came to Nigeria for three weeks of volunteer consulting. Since commercial fingerprint scanners were geared toward lighter-skinned populations, Ujam helped develop software that used image enhancement to better capture the fingerprints of darker-skinned individuals, who had less transparent skin.

The software team had to ensure OpenVR would protect sensitive data even if hardware failed. They designed the software to be as stable as possible, testing it thoroughly. They created an OpenVR recovery DVD, which Taiwo called "the Swiss Army knife" because of its array of

customized tools to fix broken systems and recover lost data. "The ability to recover data when everything else has gone wrong," Taiwo wrote, "was a critical singular component and success factor in the OpenVR deployment."[12]
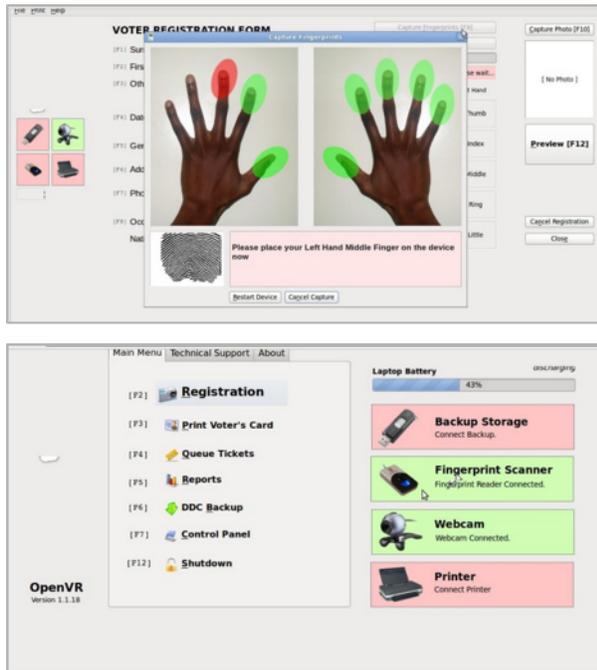
Screenshots of OpenVR (Femi Taiwo)

Reforming procurement

To lower costs and preempt public criticism, INEC implemented an ambitious new procurement process focused on rationality, fairness and openness. "It was decided very early," Odero explained, "that we were going to be the good guys. We were going to remain absolutely transparent. Our bidding and procurement processes were going to be completely open and fair." Odero studied various options for bidding processes and decided on a "reverse Vickrey auction," based on a procedure first described by the Canadian economist William Vickrey. In a reverse Vickrey auction, bidders are kept in separate rooms and simultaneously submit written bids for contracts. The lowest bidder wins but receives the price of the second-lowest bid. This gave vendors incentive to bid as close to production cost as possible, knowing that the winner would receive a rate more generous than their own offer. The simultaneous submission of written bids impeded collusion between bidders.

Initially, Odero wanted to allow losing bidders a chance to counter-bid, but the idea proved impractical. Still, INEC successfully ran a single-round reverse Vickrey auction with dozens of local and international bidders. "It was a lot of fun," said Odero, recalling that the bidders "absolutely hated it."

Price could not be the sole basis for comparison of vendor bids. INEC had to consider experience, production capacity, local knowledge and delivery speed. As part of the commission's public request for proposals, Odero published a set of scoring criteria, as well as a mathematical model for weighting the various elements. "The idea was to make it a mechanical process," he said, "so that any third party attempting to reproduce our activities would come up with the exact same outcome." This level of transparency was essential because of the scrutiny INEC's bidding process attracted due to past corruption scandals.

Odero said he prepared carefully for subsequent negotiations over the final terms of the contracts. "Before going into these negotiations," he said, "I did my homework. I sat down, read up on the vendor's culture, tried to understand their bargaining position, their BATNA [best alternative to a negotiated agreement]. We gamed it all in advance." After the procurement process, INEC—consistent with its emphasis on public disclosure—posted a complete narrative on its website, including candid reflections on lessons learned.

In early November, INEC signed contracts with three vendors: Zinox Technologies Ltd. (Nigeria), Avante International Technology, Inc. (U.S.) and Haier Group (China). The base price

per unit for each DDCM was US$1,442.62 for all three suppliers. Zinox won the lion's share of the contract, for 80,000 units. Launched in 2001, Zinox had grown into the largest integrated IT company in Sub-Saharan Africa. In 2006, Zinox had rescued INEC with a rush delivery of 11,500 computers after a Canadian firm's failure to deliver on its contract nearly scuttled voter registration. Choosing Zinox complied with a government-wide presidential directive to favor local companies in procurement and helped counter claims that INEC was captive to foreign interests. In addition, as a Nigerian company, Zinox was able to dispatch 100 engineers and managers to provide free on-site support to INEC.

Reorienting the voter registration process

In the past, INEC had relied upon locally hired temporary staff to run voter registration and balloting, as in most democracies. Because state-level INEC officials hired these workers, perceptions varied widely regarding their competence and independence. For the 2011 elections, Jega decided to mobilize members of the National Youth Service Corps, a mandatory yearlong national service program for college graduates aged 30 or younger. A total of 240,000 youth corps members mobilized for voter registration—an average of two for each of the 120,000 polling places. Odero noted that this workforce exceeded the combined soldiery of all the armies of West Africa, Nigeria included.[13] Because the youth corps members were young, educated and highly motivated, INEC had little difficulty training them to use the DDCMs. Odero cited them for their "brilliant work" in doing "a tremendous job," often facing unexpected problems, unruly crowds and security threats.

Consistent with INEC's new spirit of transparency, Odero designed the user interface of the voter registration software to focus on registrants rather than registration officers. This shift meant the voter and officer sat on the same side of the table and viewed the laptop screen together, "non-adversarial seating" that helped put voters at ease. "Because people felt part of the process, they were more forgiving and more cooperative," Odero said. This arrangement helped bridge the cultural barriers that arose because youth corps members served outside their home states and were often unfamiliar with local customs.

To make voter registration more comfortable, the team designed the software to be as simple and intuitive as possible. Odero noted that the "quality of our data was substantially better because the person whose data is being entered can watch the data being entered and immediately correct anything." In a country whose citizens spoke more than 500 languages, this aspect of the process was crucial to prevent misspellings. It also led to a significant improvement in picture quality because voters could immediately see their profile picture and decide whether to retake it. Non-adversarial seating, Odero said, "may seem like an inconsequential change, but it had a tremendous impact."

Using social media

In another use of volunteer assistance from the Nigerian Diaspora, Obi Emelonye, a popular London-based director of Nigerian films, made a series of promotional materials for INEC, including television advertisements and web-based videos. The materials were in several local languages and starred volunteer Nigerian actors. Videos encouraged viewers to register and vote, explained the processes, and implored voters to report fraud.

Beyond traditional media, the electoral commission established an online presence with a website as well as accounts on major social-networking platforms, most prominently Twitter and Facebook. However, the run-up to voter

registration preoccupied the commission's technical staff and prevented them from fully exploiting these resources. The primary drivers of social media traffic encouraging voter registration were youth activist groups like Enough is Enough, I Am Lagos, and ReclaimNaija (a slang nickname for Nigeria).

Nwankpa explained that Enough is Enough's "self-determined mandate was to see young people positively involved in governance," and "the elections provided a good rallying point to do that." The group's popularity over social media sites like Facebook and Twitter allowed Enough is Enough to be a trendsetter. As Nwankpa had learned mobilizing protests in early 2010, "If we set the trend, the boots on the ground will follow."

The youth activists collaborated to craft a collective message that would be "very simple, practical and catchy … easy for news media to pick up." They settled on the slogan "RSVP," encouraging followers to *register*, *select* credible candidates, *vote* and *protect* their vote. Celebrities embraced the movement, soliciting pictures of fans holding up their registration cards to post online. The message took off, spread by traditional media like radio and television. Nwankpa recalled his pride when a video that Enough is Enough produced called "Vote Right" was shown on for an audience of 300,000 people at "The Experience," Africa's largest gospel concert. "People began to see that this is real," he said. "This is not just stuff you read on Twitter anymore. You begin to see it—in church, on television."

By January, social media already played a significant role in drumming up unprecedented demand for voter registration. Voters lined up for hours, excited to participate in a meaningful election but still wary of trusting INEC. Their fears were confirmed on the first day of registration after the nationally televised failure of the Direct Data Capture Machines to record the fingerprints of former president Obasanjo.

OVERCOMING OBSTACLES

As Taiwo later wrote, "The first four days of registration […] were the most trying period in the entire exercise. Nothing worked as expected."[14] Odero described the experience as "utter pandemonium."

One of the vendors had failed to deliver its quota of 20,000 DDCM units, meaning there would not be enough units to serve every polling place. "Our data aggregation strategy collapsed out of the box," Odero admitted. "We had to innovate on the fly." Equipment had to be deployed around the country to accommodate places of high demand without creating the appearance of geographical bias. New equipment had to be deployed quickly. In some areas, voters responded to shortages by registering at the wrong polling stations, exacerbating logistical problems. The ensuing confusion delayed the uploading of data until the end of the voter registration process, complicating INEC's plans to evaluate field progress daily.

As Obasanjo's registration problem painfully revealed, INEC hadn't calibrated the fingerprint scanners properly. Within days, Odero figured out that the sensitivity of the scanners had been set too high to account for the sweat, dust and humidity of real-world conditions. There hadn't been enough time to run field tests. Odero said the incident demonstrated that, "Reality tends not to conform to theory all the time."

As a temporary solution, INEC had to fall back on time-consuming procedures originally meant only for registrants with special needs, like burn scars or physical disabilities. Using the new procedures lengthened voter lines and inflamed public anger. Rumors and allegations spread among the electorate over mobile phones and social media.

Advance planning paid off, however. Foreseeing such problems, the INEC team had

created a "one-click patching infrastructure" that allowed it to easily disseminate software changes to each machine. "We never had a more inspired decision," said Odero. "If we didn't have that, our goose would have been cooked."

The DDCMs had been built with software preinstalled, to avoid the logistical challenge of installing software on more than 120,000 machines across the country. However, Odero and his team knew they would be tinkering with the coding until the last minute, which meant they needed a way to update software already deployed in the field. Thus, each youth corps member received a thumb-size data storage device called a flash drive and a user name and password to log into the INEC intranet Website. Each day, corps members were instructed to find a local Internet source, log into the INEC server and download the latest software updates. Later, they inserted the flash drive into the DDCM, clicked an on-screen button labeled "update OpenVR," and any updates ran automatically. The software detected any unauthorized modifications during data transfer. Periodically, corps members traded in used flash drives at the nearest INEC office, for the verification and aggregation of registration data.

The patching process allowed the commission to quickly fix the errant fingerprint-recognition software and to respond to other technical issues as they arose. "We kept getting reports from the field about different problems," Odero said, "so we had to build the solutions and ship them out" on "almost a daily basis."

In an atmosphere of voter apprehension, even these updates fed distrust. The software updates were called "patches," a standard usage in the computer field. Unfortunately, "patch patch" in Pidgin, Nigeria's most widely spoken language, meant, "hastily and badly put together." INEC's "patch patch" technology became a running joke in the press. "They tried to libel, slander, malign and discredit me," Odero lamented, "but the

chairman of the commission stood fast and we saw it through."

The registration process improved quickly, and within days the average time for a voter to register had been reduced to the target of eight minutes. As registration officers gained experience, the time shortened to three minutes.

At a press conference, Jega instructed early registrants whose fingerprints the DDCM had not fully captured to re-register. Indicators on their registration cards allowed voters to easily determine if their fingerprints had not been recorded. It is impossible to know how many such voters re-registered, but INEC estimates that virtually all returned. The National Assembly extended voter registration by seven days (nine in some states).

Despite the electoral commission's efforts, public distrust of INEC lingered. Critics continued their attacks in the media, diminishing the goodwill that had surrounded Jega's appointment. The commission had a communication problem.

Activists in civil society saw this problem firsthand. For example, Adenike Adekanbi, a Nigerian-American who had moved to Lagos to work in public service, had set up a website called IAmLagos to promote youth civic engagement. During voter registration, she set up a hotline for assistance with voter registration and received a deluge of calls that quickly overwhelmed her volunteer staff: 40,000 on the first day alone. "People were calling about problems registering, finding their registration station, speaking all different languages," she said. She expanded the call center with paid staff and was amazed at the calls she received. "The crowd we talked to was so diverse," she described, "…We talked to market women, college students, people from other areas of the country." Enough is Enough and ReclaimNaija also experienced similar demand for assistance. Voters felt disconnected from INEC and didn't know how to get the information they

needed.

"There was a gap in communicating with stakeholders about electoral processes," said Nwankpa of Enough is Enough. "The media are politicized. Regardless of what INEC put out, the media reported what they wanted to report. There wasn't an outlet for stakeholders to get information when they wanted, to ask questions, to keep abreast of the process. We felt that social media were key to that."

After the voter registration, activists decided to engage INEC directly. "We knew that Jega would be receptive," Nwankpa said. Nwankpa knew Odero and other INEC staff. He went to their offices and found that INEC lacked the staff capacity to use its website and social media accounts to directly engage with voters.

On March 4, Enough is Enough, together with the Shehu Musa Yar'Adua Centre, a Nigerian nonprofit, convened a roundtable sponsored by the Canadian High Commission called "Promoting Two Way Communication between INEC and its Stakeholders." The conference brought together representatives of INEC, security services, civil society, organized labor and faith-based organizations. At the roundtable, Nwankpa made his pitch to INEC that it had a strategic communications problem that social media tools could solve. "The argument that sold INEC," he said, was that "social media is here to stay. Nothing is going to stop the guy who wants to put the wrong information out there. The value INEC can have is to provide an authentic channel that people can trust." Nwankpa drove the point home: "Social media is going to kill you if you're not there. Everybody is going to make up their own story."

INEC leaders already recognized this communications gap. In response, they had planned a centralized "Situation Room" led by Jega, Kuna and Ibeanu to collect information and manage communications in real time. By the end of March, INEC developed a plan for the

Situation Room to coordinate communications across a range of traditional and social media platforms, including a call center, a Twitter account, a text-messaging server, a Blackberry Messenger group, various email accounts, and a website. To manage all these accounts, INEC welcomed volunteers organized by Enough is Enough to embed at INEC's headquarters, a high-security compound generally inaccessible to the public. Throughout the election period, the volunteers managed INEC's social media accounts on all major platforms, responded to voter inquiries and reports and coordinated with civil society. By election time, INEC had 100,000 contacts on the Blackberry Messenger mobile phone application and 80,000 followers on Facebook. During the three days surrounding the presidential election, 25 million unique users accessed the INEC website.[15]

To manage INEC's Twitter account, for example, four volunteers recruited by Enough is Enough worked in staggered shifts. They sat in INEC's situation room, gathering information from multiple sources, ranging from voter-submitted tips to media stories to staff field reports. They brought urgent questions and issues to the immediate attention of INEC leaders and with their clearance, published rapid responses. "Once INEC got a Twitter account," Nwankpa explained, "it became the de facto source of information. Why wait for the briefing when you can read the tweets?" Traditional news media picked up the group's tweets and reported them, extending their reach to remote areas. INEC's tweets penetrated the cacophony of election reports. "Jega represented change, and people were willing to give him a chance," Nwankpa said. "So if INEC put out information, people were more likely to believe it."

This direct channel of communication proved especially useful when logistical delays forced INEC to delay the legislative elections scheduled for April 2 at the last minute. As

conflicting rumors of the delay and its causes circulated, "Jega" briefly became the fourth-most referenced topic on Twitter traffic worldwide. During this crisis, the commission used its Twitter account to provide the most accurate and up-to-date information available about the electoral delay. While the delay still bruised INEC's credibility, the commission projected an image of transparency and control through its online communications.

Communication was not a one-way street for the electoral commission. Odero's team had designed the voter registration software to ask voters to voluntarily submit their mobile phone numbers. During the elections, when INEC workers received reports of problems at polls, they called a random sample of nearby voters and asked them to confirm the report. INEC even used this method to track balloting materials. If a ballot box went missing, for example, INEC workers checked in with local voters. "One would say, 'we just saw this truck, it's here!'" Odero said.

The flood of voter input outstripped INEC's capacity for analysis and response. Information processed slowly because messages came in different languages and formats. To address this problem, Enough is Enough and ReclaimNaija developed free Web-based applications that enabled voters to easily generate standardized incident reports that could be sent straight to INEC via mobile phone text messages or Twitter.

Enough is Enough's program, called ReVoDa, was developed by Gbenga Sesan, one of its co-founders, with funding from Omidyar Network and the MacArthur Foundation. ReVoDa allowed users to enter their polling location and use drop-down menus to fill in information about their polling experience, similar to a brief customer service survey. The information transmitted to INEC automatically, tagged with the polling unit number, allowing INEC to map incident reports using GPS coordinates to quickly identify patterns.

Approximately 40,000 users reported incidents through ReVoDa or ReclaimNaija.

ASSESSING RESULTS

As Odero described, Nigeria's election was "one of the largest IT projects Africa's undertaken. And it was designed, developed, executed and supported purely by Nigerians."

The registration process produced a list of more than 75 million voters. When the automated fingerprint matching system uncovered almost three million duplicate entries, Odero's team had to distinguish between voters who re-registered because of technical issues and those who re-registered for fraudulent reasons. Duplicate entries with mismatched names, ages or birth dates—red flags for fraud—accounted for about 900,000 duplicates. The electoral commission segregated these entries as likely evidence of voter fraud.

On March 2, 2011, the electoral commission released a final registry of 73,528,040 voters, exceeding its initial target of 70 million. Domestic and international observers praised the list as the most accurate in Nigeria's history. For example, the Commonwealth Observer Group called the voter registration exercise "a remarkable achievement in the circumstances," concluding: "Whatever its deficiencies, overall the register does seem to provide a better basis for the conduct of the elections and a concomitant higher level of political confidence, than did previous lists."[16] Ultimately, said Shettima of the MacArthur Foundation, "Nigerians were happy about the biometrics," despite initial skepticism.

In October 2011, INEC unveiled a system for continuous voter registration designed to preempt the need to conduct mass voter registration exercises before future elections.

OpenVR, the open-source fingerprint-recognition and voter registration software designed by INEC volunteers, became available publicly for others to use, modify and improve.

During the course of voter registration, OpenVR collected more than 500 million fingerprints, generated 4.6 million electronic pages of reports, and aggregated 85 terabytes of data (equivalent to nearly 2,000 typical recordable DVDs).

INEC's efforts to guard against fraud and theft paid off. During the registration process, INEC lost only 412 DDCMs to theft and damage, an estimated data loss of 0.3%. Despite fears that politicians might set up fake registration centers to subvert the process, only two such instances were discovered and in both cases the voters were able to re-register.

During the voting, social media and mobile communications empowered voters to reach out to INEC with concerns ranging from missing ballot materials to allegations of vote rigging and security threats. According to Odero, INEC received hundreds of thousands of messages, totaling nearly three gigabytes of text. In turn, INEC sent out over 64,000 messages.

Not all of INEC's innovations succeeded. A text-message system to track and verify voting figures from each polling station, into which INEC invested significant time and effort, "failed horribly," according to Odero. In the hectic election-day atmosphere, polling staff mostly failed to transmit this data. The system also raised legal objections based on the constitutional ban on electronic voting.

While social media and mobile phones didn't eliminate corruption and ballot rigging, they discouraged the blatant fraud that had characterized previous elections. "It made it more difficult for rigging to happen," said Nwankpa. Voters used their mobile phones to snap pictures and video evidence of election fraud, which were widely circulated by phone and email. One famous video showed a woman nonchalantly thumb-printing stacks of ballots. Another appeared to show hired thugs carrying away a ballot box. Some reports of malfeasance were false, and some false reports incited panic that

may have contributed to violence. However, INEC and its partners in law enforcement worked quickly to follow up on credible tips and counter disinformation. Many journalists also sifted through social media for leads. Abubakar Ibrahim, an Abuja-based journalist, said, "That's how we got reports of things happening in the hinterland where there are no reporters and no observers."

For example, in Oyo State, rumors circulated that the incumbent governor would rig the election. Local voters tweeted and emailed reports of incidents and photographs of partial results sheets posted outside polling places. Concerned citizens across the country helped to consolidate information and tabulate and verify results. Social media helped draw INEC's attention. Before counting had ended, INEC dispatched a military brigadier general from a different state to escort results sheets from counting room to collation center. This quick action helped counter perceptions of fraud and defuse a potentially volatile situation.

Monitoring social media traffic helped INEC safeguard lives as well as ballots. Odero reported that security forces rescued over 34 kidnapping victims due to public tips. Because of Nigeria's history of military dictatorship, many citizens were wary of calling the police. INEC and civil society organizations used online engagement to publicize and normalize hotlines established by security forces, aiding law enforcement.

About 38.2 million valid votes were cast in the presidential election, representing approximately 54% of eligible voters. International observers were quick to certify the elections as free and fair. But they were far from trouble-free. Election-related violence claimed an estimated two thousand lives and left tens of thousands homeless. Twelve of the youth corps members died in election-related violence.

The final report of the European Union Election Observation Mission said: "In the face of

stringent time constraints, hampering logistical and operational challenges and various adversities INEC nevertheless managed to organize the 2011 elections guaranteeing overall effective exercise of voting rights to Nigerian citizens." The PDP maintained control over the presidency, both houses of Congress and a majority of governorships, but had their weakest showing since democracy was restored.

REFLECTIONS

Nyimbi Odero said he learned several lessons from his experience at INEC. First, "When going against big guns, you have to be absolutely resolved and determined." While proud of his steadfastness in the face of ridicule and criticism in the media that quickly devolved into personal attacks, the experience left him chastened and leery of taking on such a public role. "One doesn't anticipate the actual personal cost in advance," he lamented.

Second, Odero said it was important to "carry your boss along and explain very clearly your intention, why it's the right way to go, and be the first to state potential objections." Although INEC Chairman Attahiru Jega was not initially familiar with open-source software, Odero knew the approach fit the values he placed on transparency, public participation, cost-efficiency and new ideas. Thus, Odero and his fellow engineers worked hard to demonstrate the advantages of the open-source model that produced the OpenVR software. By the time critics caught wind of the unusual plan, Jega was a solid supporter of Odero and his strategy.

Odero said he hoped electoral commissions in other countries would take advantage of OpenVR. "Our software is free," he said. "It's out there, available for all other countries to use." He noted that the electoral staff of Kenya, among other countries, had expressed interest. "Nigeria has made some of the investments that other African countries can't make, taken the risk that

other countries can't take," he said. He was confident that if the solutions he helped engineer could work in Nigeria, they could work in other developing countries, enabling them to depend less on foreign technical consultants.

Third, Odero said he learned, "If you're going to buck the trend, you'd better win." Odero had faith in his technological approaches. While untested in an electoral setting, open-source software had long been embraced in academia and the private sector. Nevertheless, Nigeria's election was a high-stakes laboratory for such an experiment. Odero said the only choice was to "hunker down and get on the work. Ignore the chatter."

Femi Taiwo, the lead software developer of OpenVR, stressed the importance of anticipating problems. "If you perceive that there are four possible ways in which something can go wrong, and circumvent these," he wrote, "then a fifth way, unprepared for, will promptly develop."[17] Taiwo took pride in how his small team of volunteers demonstrated the expertise of African engineers. "We strongly desire the growth of the software industry here in Nigeria and Africa," he continued. "It is our passion and love for our country that was the fuel that drove us to succeed."

INEC's innovative use of social media helped to directly engage skeptical voters in the election process. Odero noted that this was part of Jega's approach to "make every person a point of security." In many ways, INEC turned the whole election into an open-source operation, an offline demonstration of the open-source dictum that "many eyes make bugs shallow." With an energized electorate, Nigeria had plenty of willing pairs of eyes.

Still, Amara Nwankpa, one of the founders of Enough is Enough, saw a long road ahead in transforming Nigeria into a full democracy. "This isn't going to take one election to fix," he said. "We assume citizens know what to do in building

a good democracy. Citizens don't, especially when they have never experienced a good democracy before," he said.

Adenike Adekanbi, who created IamLagos, voiced similar sentiments. After the election she reoriented her activism toward improving communication between citizens and government officials. "Now I really want to concentrate on good governance," she said. "It's very important that people, the youth especially, have an open line to the government."

While these activists were proud of how their online communications helped to engage youth in politics, they were aware that transforming governance is far more difficult than organizing voters. "Protest is easy. We planned it in two weeks," Nwankpa said. "Governance is hard.

You actually have to sit down and write and research and know the issues. People have to be more dedicated, you can't breeze through it."

Nwankpa predicted that social media would be a battleground in the next election. "In 2015, the social media war will be huge," he said. By the time Nigeria's 2011 elections ended, all major candidates had crafted strategies for online communication. Nevertheless, Nwankpa cautioned future candidates not to equate an online presence with real-world support. "Social media is not going to help you build capacity," he said. "Social media helps you set the trend; it tells you what you'll be reading in the newspaper tomorrow. But you have to back it up with capacity on the ground."

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[6] In 2011, approximately 70% of Nigerians were under the age of 30, according to the U.S. Census Bureau International Database, http://www.census.gov/population/international/data/idb/country.php (2 November 2011). For more on Jega's engagement of civil society, see related Innovations for Successful Societies case study *"Toward a 'Second Independence': Repairing Nigeria's Electoral Commission, 2010–2011."*

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