One Man One Vote in Nigeria: Operations Research Models to the Rescue

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Abstract
This paper advocates the possible introduction of operations research model as a panacea to good electioneering process. In recent time, the reigning rhythm amongst Nigerians is “one man one vote”. This is becoming more popular on daily basis, more importantly in the camp of opposition leaders who felt they had been cheated in the past. The fact that the crises of election rigging in Nigeria is graduating and assuming a dangerous dimension is no longer news; the incessant election petition tribunals after the 2007 election is an attestation to this fact. Election rigging in Nigeria; its implication on the economy, society psychological feelings, and the fact that the state is assuming a frightening dimension is an attestation to the fact that something urgently must be done. In solving this problem therefore and to ensure that electorate’s votes count, an adoption of scientific methodology (both qualitative and quantitative) approach is required. It is from this perspective therefore, that this study advocate the use of operations research models (Simulation, Queuing and Stochastic) to alleviate the lingering electioneering problems in the country. The recent event, where electorates voted till late in the night is an attestation to the fact that something urgent must be done.

Keywords: operations research models, one man one vote, delineation, ballot, polling units and voting

INTRODUCTION
The fact that the crises of election rigging in Nigeria is graduating and assuming a dangerous dimension is no longer news. Election rigging in Nigeria; its implication on the economy and the fact that the state is assuming a frightening dimension that need urgent to be checkmated is an attestation to the fact that something urgently must be done. In solving problems however, both qualitative and quantitative approach is required. Aftermath of the ongoing election petition tribunals across the nation indicates that, elections can be rigged by either or combination of two or more of the following: (i) Ballot stuffing, (ii) Multiple voting, (iv) Inflation of figures, (v) Return of figures without voting and so on (Adesua, 2010).

One primary thing is that all these can be done after voting had taken place. Apart from the above are other possible means such as: (i) Intimidation of voters (at times by scaring them with guns) (ii) Voters register list manipulation (iii) Ballot box snatching approaches (Odirwin, 2003).

The implication of this development is loss of confidence in the Nigeria State by the investors, incessant unrest, political agitation, instability, corruption, loss of dignity etc at both internal and external level. Rigging and other electoral vices have become serious threat to democracy in Nigeria. Current developments identify judicial corruption, expensive electioneering and faulty voters register as dangerous to our democracy. These current developments are used to sustain fraud perpetrated at polls, legalise illegitimate election and suppress the wishes of people.

The history of election rigging in Nigeria has been dated to the period of colonial master. Smith (2005) claimed that the British Colonial Government rigged the 1956 regional elections in the Western Region in favour of the NCNC; that the NCNC were favoured to form the independence government by the British against the Action Group; that the British government rigged census figures to favour the Northern Region and that the violent overthrow of the first Republic was brought about to persecute some identified threat in the society, due to their opposition roles. If these claims are anything to go by, then Nigerian electoral system has been built on fraud. If this is the case, credible election is difficult to conduct without sincere commitment on the part of rulers.

If rigging, has indeed, become an electoral culture in Nigeria, and is having negative implication on the psyche, development and integrity of the country, then, how do we organize credible election in this country? Several suggestions have been made by the stakeholders in this respect, such includes; e-voting, credible voters registers, credible census, true independent and transparent Independent Electoral
Commission (INEC) policies etc. While some suggested approaches, by experience are failed ploys, others are ignored as lacking merit. But no suggestion has been made in the areas of application of operation research models. It is against this background that we suggest the application of operation research models for credible voting system in Nigeria, which forms the crux of this work.

PURPOSE OF STUDY
All and sundries in Nigeria seems to be tired of election rigging (malpractices) in recent time. This became more evident in the effort made by Mr. President (Dr. Goodluck Ebele Jonathan), when he removed the erstwhile election umpire and replace him with Professor Ataiura Jega. The just concluded election was adjudged to be fair, compared to previous elections in the country (popular opinion after 2011 general elections). However, elections still nose-dived to very late in the night at various pooling boots across the nation, despite all machineries put in place. Since operations research is into optimum allocation and utilisation of resources, out of which time is involved, it becomes imperative that identified models in operations research that deals with resource allocation under various circumstances be called to action. This is expected to assist in adding flavour to the government and citizens’ agitation for free and fair election in the country.

RESEARCH PROBLEM
The electioneering process in Nigeria has come of age, even now that we are age 50. This is expected to be the focal issue in the mind of any serious Nigerian adult, more importantly those who believe that it is not palatable to be a fool at 40 years of age. Various elections in Nigeria has come and gone; but not without hitches here and there. The story of 1979, 1983, 1993, 1999, 2003 and 2007 still lingers in our mind. The volume of election petitions received by various election petition tribunals across the nation is not only worrisome to the citizens, but equally a source of worry to the international community. In Nigeria, it is expected that 500 voters would vote per polling boot, 7 hours is earmarked for voting and voting to take place in a day. The clamour for one man one vote could become a mere day dreaming, if the time allotted for election is not sufficient; if queues are maintained arbitrarily due to non-conformity of population to time allotted and capacity, there is every possibility that some intended voters can be disenfranchised, while some might benefit from the ugly event and cast multiple votes. The crux of this work therefore is to see how operations research models can be used in determining the sufficiency or otherwise of the time allotted for voting exercise vis-à-vis the number of expected voters per polling boot; advocating combination of simulation, queuing and stochastic models to the rescue (The Nation, Punch and Business Day, 2010).

Current Approaches to Credible Elections in Nigeria

Adoption of Justice Uwais Electoral Reforms
The much applauded electoral reforms carried out by Uwais Committee has become a document that every Nigerians needs to be implemented. The basic provisions as highlighted by Face (2010) are:

1. Independent Candidacy: Section 65 (2) (b) and 106 of the 1999 constitution should be amended to make provision for an individual to run as an independent candidate.

2. Procedure for the appointment of the chairman and members of INEC Board: For the above, national judicial council should: (i) Advertise the Positions, spelling out requisite qualifications, (ii) Receive application from the general public, (iv) Short list three persons for each post and (v) Send the nominations to the national council of state to select one for each position and forward to the senate for confirmation.

3. Removal of INEC Chairman and Board Members from the office: The Chairman and members of the INEC Board may only be removed by the senate on the recommendations of the National Judicial Council (NJC) and approved by two-third of the senate, which shall include at least two members of the minority parties in the senate.

4. Funding: The Election fund and the recurrent expenditure of the INEC offices (in addition to salaries and allowances of the Chairman and Board Members) shall be based on the Consolidated Revenue Fund of the Federation.

5. Dates of Elections: Section 132(2) and 178(2) of the 1999 constitution should be amended to specify the period for considering petitions as follows: “The determination of cases by tribunals should take four months and appeals should take another 2 months.
The Gap in Existing Reforms
Justice Uwais reform is the most celebrated reform embraced by both the opposition and independent minded citizens; though, not fully accepted by the government and other government agencies. The fact that the electoral act was a subject of several litigations and amendment attests to this. Meanwhile, if Uwais report is fully adopted, several questions would still be begging for answers in Nigeria elections.

(a) Would the provision guarantee free and fair elections?
(b) To what extent will the committee and reform checkmate election rigging and violence in Nigeria?
(c) How can rigging be checkmate through election logistics?

Preventing Riging through Election Logistics
In this work, we refer to election logistics as the systematic and scientific way of voting. Voting process begins with delineation of constituency. A ward is composed of voting unit. INEC requires that a polling unit should not accommodate more than 500 voters. The problem of this work therefore is to determine whether all the 500 voters per unit as entrenched in the rule of delineation would eventually vote, or there would be cases where more than this figure would be returned as having voted; and where such is possible, what exactly should be done to ensure that all registered voters (who are capable of voting as at the time of election) would have the opportunity of casting there votes and on no account should votes from any unit exceed the expected number of voters.

Bringing in Operations research model to this study would reveal the following:
- Is the time allotted for voting per day sufficient for 500 voters?
- How many minutes would it take a registered voter to cast his/her vote?
- To ensure that none of the 500 voters is disenfranchised, are number of servers available for elections sufficient?
- To boost voters morale and avoid stress, how many minutes it would take a voter to stay on the queue before being attended to?
- What shall be the expected number of voters per polling unit?

Operation Research and Maximum Voters Assessment
Many issues arise from the number of voters per polling unit. First, what is the maximum number of people that can vote in a given unit and within the time limit assigned for voting? In most cases, voting officially commence at 8:00am and ends by 3:00 pm. This is about 7 hours. It can then be logically questioned that how many people can vote within 7 hours in a polling unit. This is not to shy away from the fact that in Nigeria, there are instances where voting continues sin-a-die. The recent re-run election in Ekiti State, where election took place in some locations at 11 days interval is an attestation to the fact election timing is not fixed in real context. However, one can heave a sigh of relief now that the said election result has been nullified by a court of law.

In answering the above questions therefore, the first step is to determine how many minutes it would take a voter to vote. Giving the first voter, how many minutes will it take the next voter to vote? This routine continues, until the last voter i.e. 300th or 500th or as the case may be in the unit or register. In relation to this, the need to establish voting process is imperative. Voting process include: Accreditation of voters, thumb printing, dropping of paper in box, marking the thumb and perhaps waiting on the queue. How many minutes will exit of this program take? After this has been done, the summation of average time for each voter will then give the totality of time it can take to attend to the voters in a particular unit.

A relevant approach to determine the required time to be spent on queue is referred to as operation research model (Hillier and Hillier, 2005). A suitable definition of operation research in this context is the one given by Daellenbach and George (1978) in Sharma (2009) as systematic application of quantitative methods, techniques and tools to the analysis of problem involving the operation of systems. Given this definition, it follows that we can use operation research techniques in relation to the “ideal unit capacity” of our poling units. This would enable us to:

(a) Determine the average time a person will be on the queue to vote
(b) Estimate the expected number of people that can vote within the approved seven hours voting limit
(c) Determine the adequacy of otherwise of the polling units within a ward
(d) Assess the adequacy of servers and service points in a polling unit
(e) Suggest the maximum voters that a voting unit can accommodate.

The management scientist approach to enhance this is as listed by Hillier and Hillier (2005) as:

(a) Determine the problem and gather data
(b) Formulate a mathematical model to represent the problem
(c) Develop a computer based procedure for deriving solution to the problem from the model
(d) Test the model and define it as needed
(c) Apply the model to analyse the problem and develop recommendation for management.

(f) Help to implement the team’s recommendations that are adopted by management.

**Operations Research Models and Application to Electioneering Process for Credible Election.**

Considering the fact that operations research is scientific in nature and capable of providing optimum solution to problems emanating from situations of multiple constraints, the following models are postulated for possible adoption in the achievement of credible election in Nigeria.

**Stochastic - Simulation and Queue Models**

Considering the states of nature abounding in decision making (risk, certainty, uncertainty, games and competition); the situation under which probability of occurrence of an event is known a priori and constant, but less than one is known as probability of occurrence of an event is known a priori and constant, but less than one is known as risk. This of course negates the deterministic concept and thus, bringing to forefront the principle of stochastic nature of events. Simulation is a very powerful and widely used management science technique for the analysis and study of complex systems, whereas, a queue is said to occur when arrival rate is greater than the service rate (Wayne, 2003). However, it is the technique that imitates the operation of a real world system as it evolves over time (Sharma, 2009). For instance, in a single server queue system, customers arrive into the system from some population and either goes into service immediately, if the server is idle or joins the waiting line, if the server is busy. This can be seen as a combination of simulation and queue models.

For election and voting, the arrival is expected to be drawn from a finite population of ≥ 500 per polling unit, there is usually unlimited waiting room capacity (considering the fact that voting is done in an open field), customers would be served on first come first served (FCFS) basis (in a sincere and sane environment) and we also assume that arrivals occur one at a time in a random fashion, without any given distribution of the inter-arrival times.

To demonstrate the simulation model, we need to define several variables:
- Tm= Clock time of the simulation
- At= Schedule time of the next arrival
- Dt= Schedule time of the next departure
- SS = Status of the server (1 = busy, 0 = idle)
- WL= length of the waiting line
- Mx= Length (in time units) of a simulation run

The fact that it can not be determine a priori the number of voters that would eventually cast their votes in a polling unit, then the appropriate simulation model would be a stochastic simulation model. That is:

\[ \text{E}_{L_e} = \frac{\int_0^T N(t)dt}{T} = \frac{\sum_{i=1}^m A_i}{T} \]  

(1)

Where:
- \( T = \) length of the simulation
- \( N(t) = \) number of terminals online at time t
- \( A_i = \) Area of rectangle under \( N(t) \) between \( e_{i-1} \) and \( e_i \) (where \( e_i \) is the time of the \( i \)th event)
- \( M = \) number of events that occur in the interval \((0,T)\)

If probabilistic values of the possible average number of voters per polling unit can be identified (going by historical information), the average number of polling unit is known, and the number of hours assigned for voting are known and can be determine a priori, it is then possible to predict the average number of minutes that a given voter would spend waiting to be attended to in the queue. Even where available information is limited in quantum, simulation gives room for random numbers generation.

With good combination of stochastic, simulation and queue model, the following can be achieved:

- Expected average number of voters that can vote within the given seven (7) hours earmarked for election in Nigeria can be estimated.
- Electorates and election umpires would be weary of declaring spurious election results from polling units, knowing fully well that the expected estimated figure is the benchmark for polling units’ delineation.
- Election umpires would be properly guided as to the sufficiency and adequacy of the estimated number of servers, service points (polling units) and the number of prospective voters earmarked for the election process.
- If only seven (7) hours are available per day for voting and voting is expected to take place in a day, it could then be logical to say:

(i) Queuing model would assist to determine the average number of minutes a voter would spend before being attended to (assuming that the facility capacity is known and constant).
(ii) Assuming the number of minutes it would take voters to cast their votes is not fixed, that is vary; considering the page positioning of individual names on voters register, The use of simulation model can equally assist in determining the supposed closing and elapsed time for voting activities with the current standard of 500 voters per polling unit.
(iii) Stochastic modeling can equally play a role in moderating the probabilistic effect of the simulation process (taking a cue from the stochastic - simulation model)

CONCLUSION
The crux of this work therefore is an advocacy for application of scientific approach to resolving electioneering problems in Nigeria. This becomes imperative going by experience; that if scientifism is perfectly adhere to, it can guarantee free and fair election, equity among stakeholders in pre and post election periods. No wonder, Fredrick Taylor is an ad infinitum celebrity in the field of management as the father of scientific management. Scientifism is one concept we all can not afford to shy away from.

POLICY IMPLICATION
If the cry for free and fair election via one man, one vote is anything to go by, then, application of a scientific method is a must. If we are all educated and aware of the expected number of minutes it would take a voter to cast his/her vote, then decisions can be taken as to sufficiency or otherwise, reliability or otherwise and validity or otherwise of the (i) Allotted number of hours for voting per day, (ii) Estimated number of voters per polling unit, (iii) Estimated number of polling units, (iv) Results of election as may be released by electoral umpire, (v) Estimated number of servers and (v) The currently adopted voting system of open secret ballot

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