

Design and Implementation of Electronic Election Campaign System

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Abstract

Researches have been conducted over the years till date on the importance of election campaign in the fields of electoral studies, political studies and the use of information systems to assist the process. The use of computer technology in developing information systems to support several aspects of election campaign has also continued to evolve. System analysis best practices on the use of qualitative research methodology, Unified Modelling Language (UML) to enhance communication as well as rapid prototyping tools were explored and those well suited were used effectively. The emphasis of this work is to deduce how to provide computer support to improve gathering, analysis of data and information from face-to-face canvassing as well as conducting effective get-out-the-vote (GOTV) activities before and on election day. The system will be web based in order to ease communication and user interaction with the system. As one might expect for web based systems, Hyper Text Markup Language (HTML) will be used to display results in the web browser that will be visible to the user. Therefore, in this work, PHP Hypertext Preprocessor (PHP) was used for coding the core logic of the system and this runs on Apache web server, JavaScript for validation and printing facility, cascading style sheet (CSS) and lastly MySQL for database all residing on Apache web server. The present application will assist campaign managers, staff, as well as volunteers to carry out their duties more accurately and effectively.

Keywords: Information Systems, System Analysis, Software Engineering, Election Campaign, Campaign Violence, face-to- face canvassing

1.0 Introduction

Over the years, conducting campaigns for election has been the most feasible way for political parties to maximize the number of votes from prospective candidates. This is evident according to the research conducted by Hogan [1] which established that campaigns are important contributors towards turnout rate during elections. In addition, researchers have also noted that not only do various campaign activities have positive impact on turnout but they also influence the choice of party voted for [2]. It is obvious from the impact of election campaign that the process of gathering necessary information that helps the outcome of campaign and consequently election result is significant. In Nigerian context, election campaign over the years is generally associated with occurrence of violence. Consequently, conflicts that arise during campaigns lead to electoral malpractices and problems such as the use of hooligans, bribery of voters in cash or kind, use of derogative language against opponents, campaigning or canvassing for voters based on religion tribal or sectional bias for the purpose of opposing a particular political party or election of a particular candidate [3]. A typical election campaign process is depicted in Fig. 1.

Performing campaigns manually poses problems for campaign team in several ways. One of such problems is difficulty in collating the responses gathered by canvassers allocated to different or the same area. This can lead to inconsistency and incomplete information from the face-to-face canvassing. Another problem that becomes evident on the election day is communicating the details of yet to vote supporters that were identified during canvassing to the party office for performing knock up as early as possible. If this problem is not handled carefully, other party candidates that have equally canvassed the same eligible voters might have more chance to knock up earlier thereby reducing the chances of winning.

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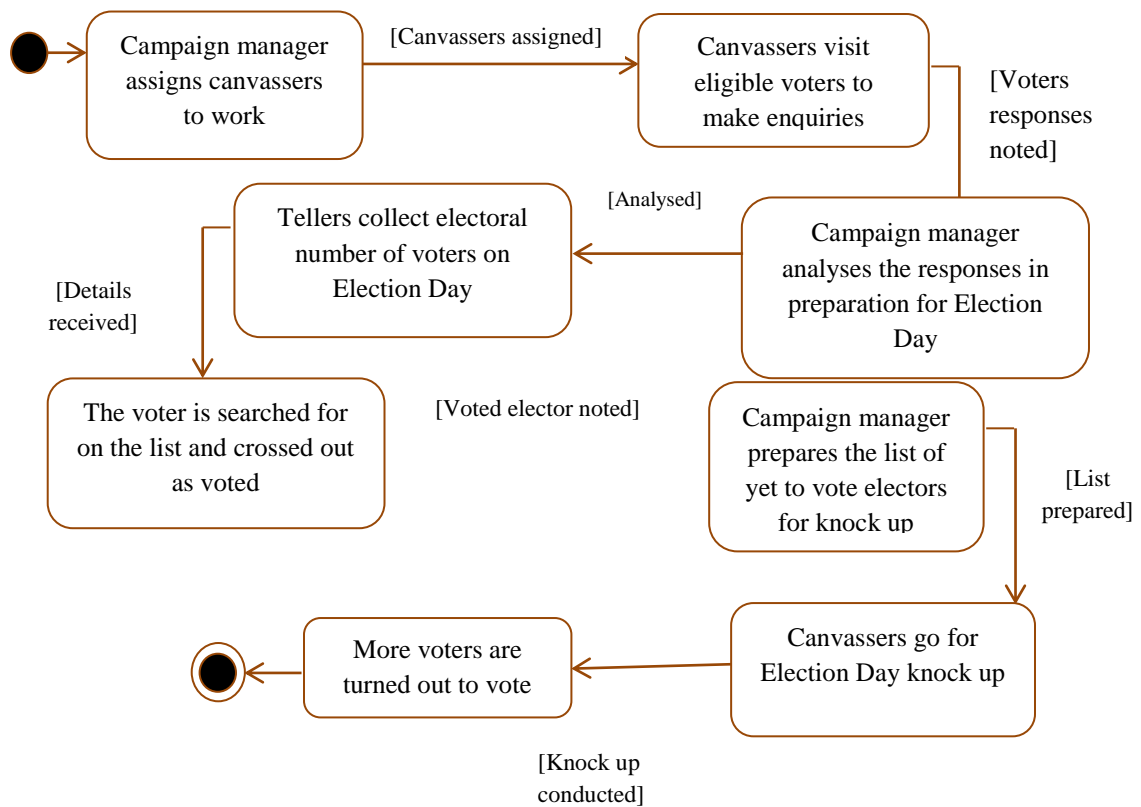


Fig. 1: Election Campaign Process

Previous researches especially in the field of Political Science, International Relations and Election Studies have employed various experiments and different types of campaign activities such as political broadcast, face-to-face canvassing and telephone canvassing [2,4,5]; it is pertinent to harness advancement in technology to improve the campaigning activities. Therefore, the aim of this research is to design and implement an electronic election campaign system using System Analysis best practices, database and software engineering design principles to capture user requirements that are important for the system. More precisely, the present study is designed to develop a web based application with user interface and back-end database which contains the electoral register to be used for face-to-face canvassing and get-out-the-vote (GOTV) activities. This will be followed by implementation of the system to provide support for campaign manager for keeping track of likely supporters for the party in order to maximize the number of votes for the party hence increasing the chances of winning the election, and finally user acceptance test to validate the functionalities of the designed system will be conducted.

2.0 Materials and Methods

The electronic election campaign system comprises of graphical user interface and database. The two aspects require gathering of requirements from stakeholders and potential users of the system. Therefore, qualitative research method was used. Interviews were conducted with stakeholders in election campaign, mainly campaign managers, party activists and staffers of electoral commission. Both structured and unstructured interview methods were employed. In-depth questions regarding the requirements of the system were asked. Academic journals, books and articles on database development and software application development, electoral and political studies were consulted. Relevant and valuable information about system analysis, software engineering principles, database management system, electoral and political studies were accessed from E-journals and E-books on the internet.

There are several software development models that can be considered for the user interface and database development including waterfall development model, spiral development model and agile development model. Agile software development is an iterative design process where the overall system requirements are implemented incrementally based on users' feedback [6]. The methodology allows for requirements changes during development therefore stakeholders are involved in the design process in order to fine tune the requirements and verify prototype [7]. Therefore, in an attempt to ensure that all requirements are implemented and all errors fixed early during the development process the agile software development was used.

There is a long list of web programming languages and database that can be used to design the electronic election campaign system. The system will be web based in order to ease the communication and user interaction with the system. As one might expect for web based systems, Hyper Text Markup Language (HTML) will be used to display results in the web browser that will be visible to the user. PHP (PHP Hypertext Preprocessor) was used for coding the core logic of the system and this runs on Apache web server, JavaScript for validation and printing facility, cascading style sheet (CSS) and lastly MySQL for database all residing on Apache web server.

In order to achieve the aim of using agile development, designing a piece of system that provides the required human-computer interaction with frequent prototype within the short time constraint, CakePHP framework was used to develop the electronic election campaign system. Cake is a free, open-source, rapid development framework for PHP that uses clean MVC design pattern which enables PHP users to develop robust application rapidly without compromising flexibility. Generation of code and scaffolding features is used to build prototypes [8, 9].

2.1 Requirement Gathering Approach

Requirements' gathering is an important step towards building systems that satisfy users' requirements as well as business goal [6]. Interviewing domain experts provides in depth information about the domain knowledge as well as opportunity to probe further on ambiguous requirements of the system. Background reading which provides information about election campaign and the need to use technology to improve the process, past research on impact of face-to-face canvassing, and the most appropriate combination of programming languages and technologies that can be used [10]. Document sampling as applicable to this research eased gaining more insight into how the electoral register is organised. The entities, relationships and attributes required for the database design were obtained from this process. After rigorous use of the all the requirement gathering method mentioned above, the essential requirements for the system to perform its functions are listed in Table 1. In addition, the user requirements for the system were modelled as use case diagram in Fig. 2.

Table 1: The User Requirement List for the Electronic Election Campaign System

NO	Requirement	Use Cases
1	The system should have a database that contains the details of the electoral register.	
2	To add the name, address and contact details of campaign staff or volunteers	Add new campaign staff or volunteer
3	To assign staff and volunteer assigned to particular area	Assign campaign staff or volunteer to work
4	To be able to note voters that has already voted	Note voted elector
5	To allow searching for voter's details on election day	Search electoral register
6	To be able to view and print out list of registered voters that has been visited.	Print visited list
7	To be able to view and print out knock up list of registered voters that promised to vote but have not turned out to vote on election day.	Prints knock up list
8	To be able to add new campaign	Add new campaign
9	Campaign manager, staff and campaign volunteers should be able to login	Login
10	To be able to add voters response on whether they will vote for the party or not	Add voters response
11	To be able to note voters already visited	Note visited elector

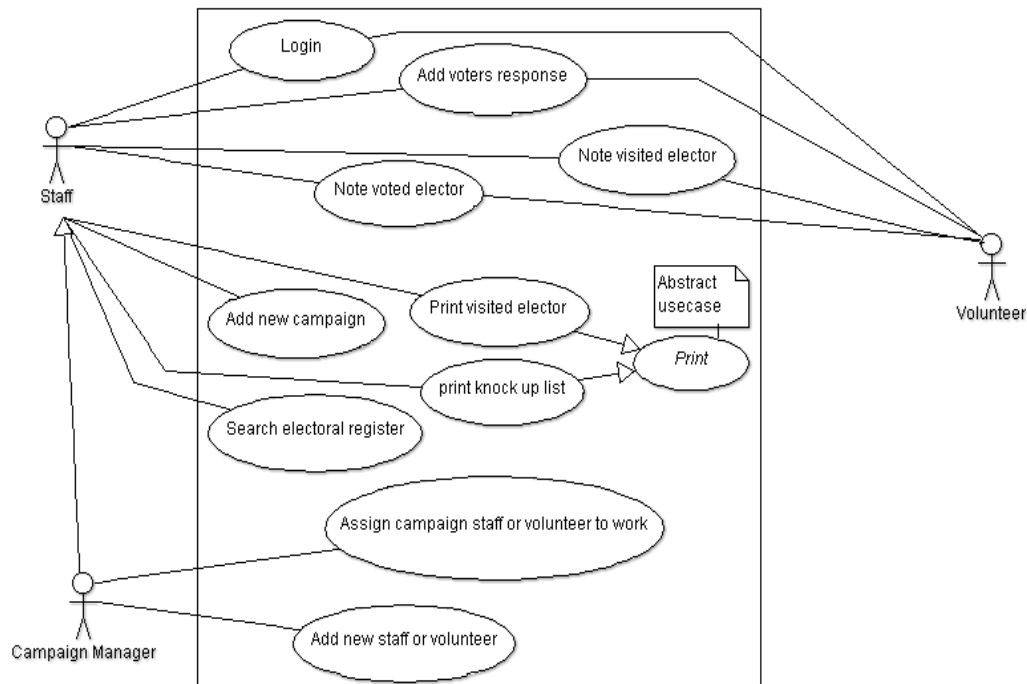


Fig. 2: Use Case Diagram for the Electronic Election Campaign System

2.2 Database Design

Entity relationship diagram as applicable to the electronic election campaign system was used to model entities, attributes and relationships between the entities (Fig. 3). Furthermore, relational database schema which contains the set of normalised relations each with a distinct name and integrity constraints [10] was developed to ease the process of mapping into physical database tables in MySQL. The relational database schema for the campaign management system is as follows;

Constituencies (id, name)

Staffs (staff_id, firstName, lastName, mobileNumber, emailAddress, type)

Campaign_Staffs (id, ***campaign_id***, ***staff_id***, ***polling_id***)

Campaigns (id, title, date_started, date_finished, status)

Campaign_results (***campaign_id***, ***eligible voter_id***, isSupport, isInterested)

Eligible_voters (id, electoralNumber, firstName, lastName, houseNumber, ***postSuffix***, ***polling_district_id***)

Polling_district (polling_id, ***ward_id***)

Street_Indexes (street_id, streetName, type, ***postalDistrict***, ***polling_id***)

Wards (ward_id, wardName, ***constituency_id***)

Postal_districts (postal_district_id)

Credentials (id, username, password, role_id, ***staff_id***)

Voters (id, ***campaign_id***, ***eligible voter_id***)

Note: The primary Keys are underlined and foreign keys are bold and italics.

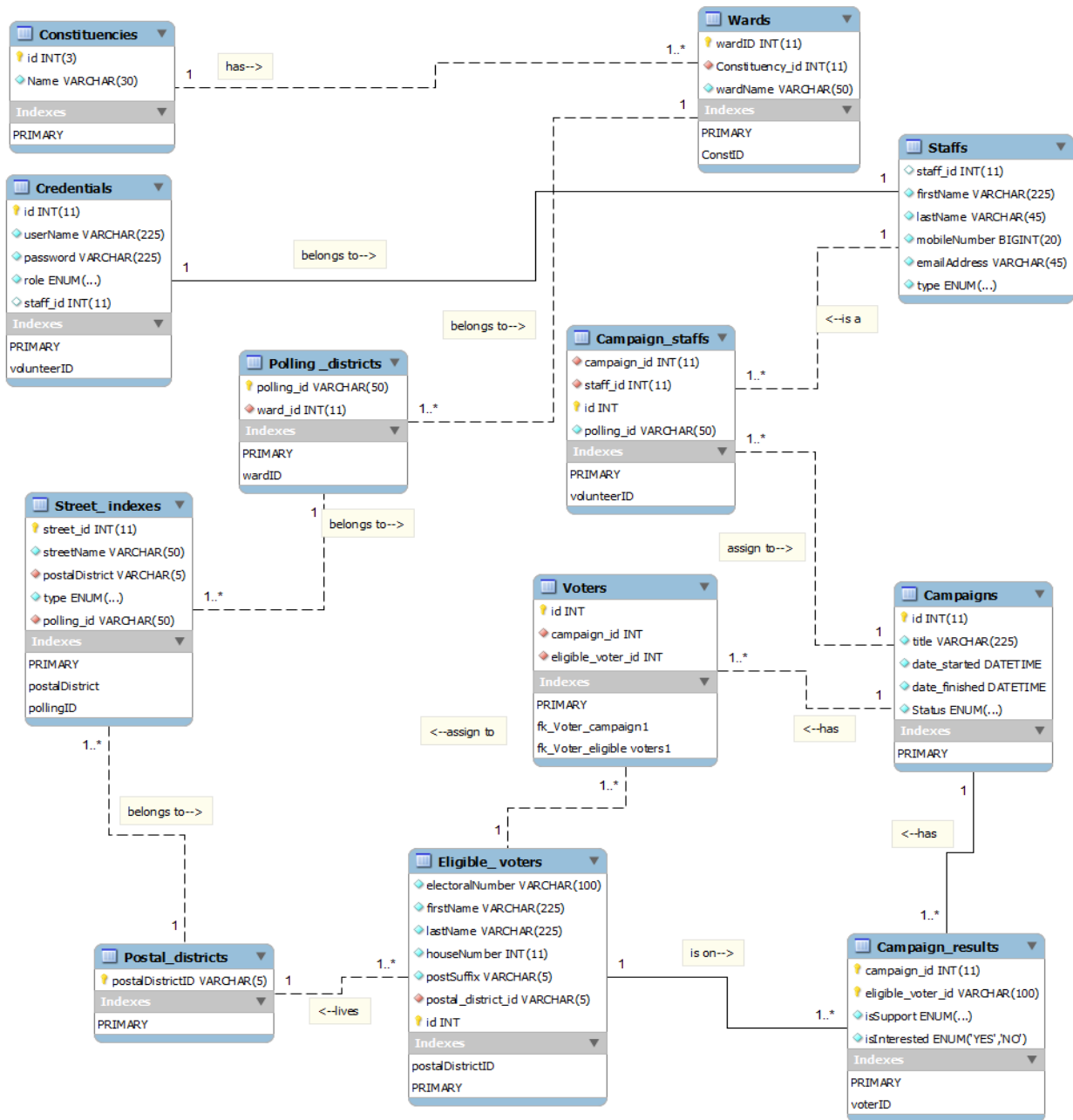


Fig. 3: Database Entity Relationship Diagram for the Electronic Election Campaign System

3.0 Results and Discussion

The application is divided into two parts which are front-end (user interface) and back-end (database). The front end is the part of the application visible to the user and from where the user can interact to perform designated functions. The back-end on the other hand contains the data. The pictorial description of how the technologies work together to perform the functions of the system is presented in Fig. 4.

3.1 User Acceptance Test (UAT)

User acceptance testing was used to evaluate the system to ensure it worked in accordance to user requirements. To perform this test, a test script based on use case scenario was prepared. It contains the description of the test, test data, the expected result and the actual result. Table 2 shows the test script used for the user acceptance test.

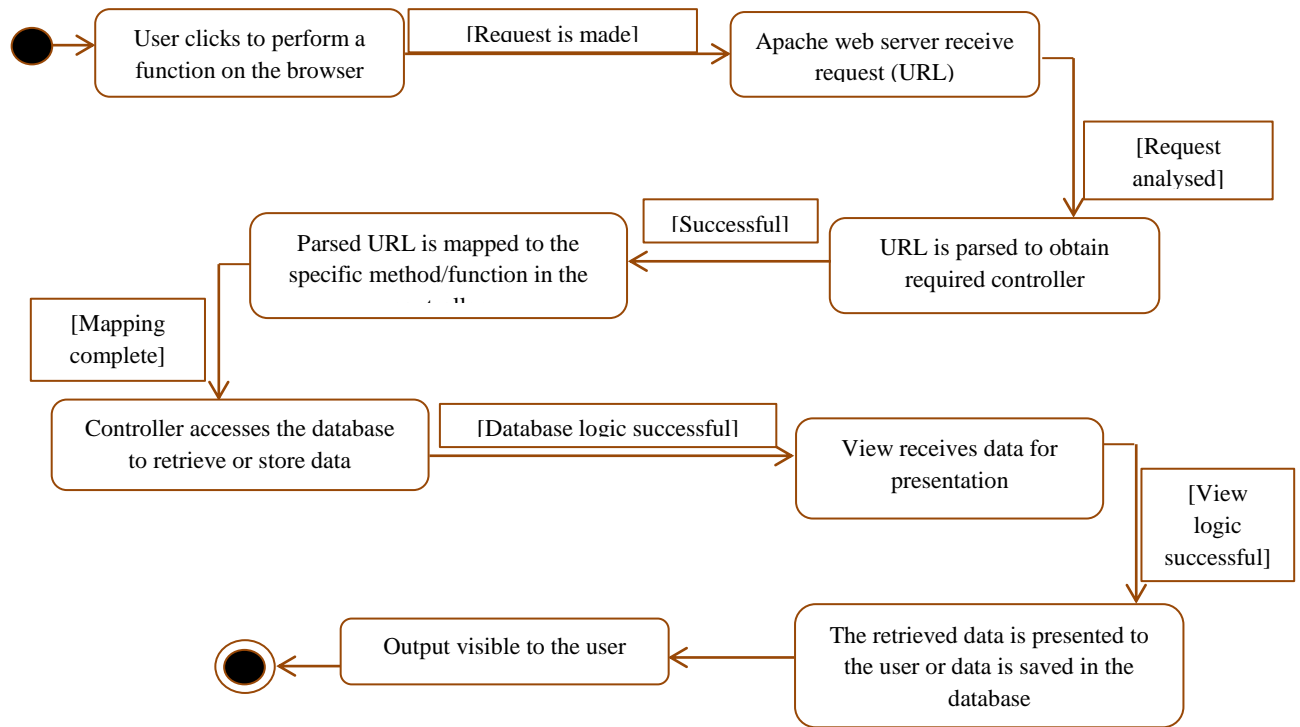


Fig. 4: Activity Diagram Showing How the Technologies Work Together

Table 2: User Acceptance Test Script used for the Electronic Election Campaign System

Use case 1:Assign staff/volunteer to work				
Purpose: To test assigning of staff to work				
Id	Description	Test data	Expected Result	Actual Result
1	Assign staff to work	Name: Tope Aliyu. Polling district: EIL1	The staff should be assigned to polling district EIL1 and save into the database.	Staff assigned and message displayed that staff has been added.
Use Case 2: Note visited elector				
Purpose: To test if the visit to voter is noted in the database				
Id	Description	Test data	Expected Result	Actual Result
2	Note visited elector	Electoral number:BB1/65	The name and address of the voter should be displayed. When the response from the voter is saved the details of the voter should be saved in visited elector list	The correct name and name displayed and details of voter is saved in visited list
Use Case 3: Print visited list				
Purpose: To ensure the list of visited voters can be printed				
Id	Description	Test data	Expected result	Actual result
3	Print visited elector	List of visited elector in polling district Bow East 1	When the show visited button is clicked the list of all visited electors should be displayed. Selection of polling district and clicking on print button enables printing	List displayed and printed out

Use case 4: Add voters response				
Purpose: Used to add voter response to the database				
Id	Description	Test data	Expected Result	Actual Result
4	Add voters response	Voter agrees to support and volunteer.	The response should be saved in the database.	Response saved in the database and added to supporters and volunteer's list
Use case 5: Print Knock up list				
Purpose: To ensure that it is possible to print the list of those that have yet voted on polling day				
Id	Description	Test data	Expected Result	Actual result
5	Print knock up list	Yet to vote electors in Mill Wall polling district	Clicking on yet to vote button should load the list of yet to vote voters. Selection of polling district filters the list. Then selection of print enables the printing option.	The list is displayed and printed.

4.0 Conclusion and Recommendation

Electronic election campaign system provides solution for organizing data and information gathered from face-to-face canvassing, collating the list of yet to vote eligible voters and effective sharing of information between campaign personnel at the polling unit and those at the party headquarters. The solution eliminates gathering, disseminating and sharing of information problems encountered during the traditional election campaign.

Electronic election campaign system's core requirements for the current research have all been implemented. However, there are more that can be done to make the system more powerful. Involvement of the stakeholders especially the campaign manager in the development of the system revealed additional requirements which is an advantage of using agile development approach. Areas for further work include additional support for transferring results of previous campaigns to new ones. Map for easy location of voters' address would also be an added advantage. The election campaign management system currently is not compatible with mobile platform. This is also an area for further improvement because of the advancement in the mobile technology and the easy access to web services it provides.

It is also worth noting that the trend in election face-to-face canvassing and other campaign activities is now moving from just web based and smart devices campaign systems to the integration of these systems with social websites such as Facebook. This takes advantage of large number of users and relationships between users to identify more supporters. This idea can be incorporated into Nigerian politics so that each political party can know beforehand likely supporters. Moreover, the innovation will help political parties caution their supporter in preparation for any election. Therefore, this is an area worth exploring in other to provide improved services for political party campaigns.

5.0 References

- [1] Hogan, R. E. (1999). Campaign and Contextual Influences on Voter Participation in State Legislative Elections. *American Politics Research*, Vol. 27, No.4, pp. 403–433.
- [2] Whiteley, P., and Seyd, P. (2003). Party Election Campaigning in Britain The Labour Party. *Party Politics*, Vol. 9, No.5, pp. 637–652.
- [3] Nnanta, N.E., Eme, O.I. and Asogwa, N U. (2014). Ethics, Accountability and Transparency in the Conduct. *Arabian Journal of Business and Management Review (OMAN Chapter)*, Vol. 4, No. 3, pp. 21-30.
- [4] Gosnell, H.F. (1927). *Getting-out-the-vote: An Experiment in the Simulation of voting*. University of Chicago Press, Chicago.
- [5] Kramer, G.H. (1970). The Effects of Precinct-Level Canvassing on Voter Behavior. *Public Opinion Quarterly*, Vol. 34, No.4, pp. 560–572.
- [6] Bennett, S., McRobb, S. and Farmer, R. (2010). *Object-Oriented Systems Analysis and Design using UML*, 4th ed. McGraw-Hill Education.

- [7] Aoyama, M. (1998). Web-Based Agile Software Development. *IEEE Software.*, Vol. 15, No. 6, pp.56–65.
- [8] CakePHP. (2014). CakePHP Conventions — CakePHP Cookbook v2.x.x documentation. Retrieved January 26, 2014, from <http://book.cakephp.org/2.0/en/getting-started/cakephp-conventions.html>
- [9] Bari, A. and Syam, A. (2008). *CakePHP Application Development Step-by-Step* introduction to rapid web development using the open-source MVC CakePHP framework. Packet Publishing Ltd. Retrieved from <http://www.developmentbd.com/blog/CakePHP-Application-Development.pdf>
- [10] Connolly, T., and Begg, C. (2010). *Database Systems A Practical Approach to Design, Implementation, and Management*, 5th Ed. Pearson Education, Inc.