

ONLINE VOTING SYSTEM. A CASE STUDY OF THE PEARL OF AFRICA MUSIC AWARDS.

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ABSTRACT

Most of the awards in Uganda be it politically motivated, sports, music or academic have been resolved by a majority vote and those some of them are conducted physically the biggest batch of musical awards have been conducted electronically largely on social media accounts and some on specific websites whose links are provided on different social media accounts and though some others are carried out using mobile phone SMS. This has resulted into so many irregularities and cries of malpractice rendering the whole election a sham and therefore making the credibility of the outcomes questionable. In this project proposal I carried out immense research and came up with a system proposal that could be used to solve most of the flaws of the current system thereby coming up with a new and better system to carry out these activities and improving the credibility of the whole results and outcomes hence adding quality to the awards. The case study was the Pearl of Africa Music (PAM) awards which were at their peak during the early 2010s and started to decline during the later parts of the 2010s with the majority of the population complaining of vote rigging and other malpractices which damaged the credibility of the awards immensely and hence damaging the awards as a whole leading to their decline and eventual collapse. The researcher has reason to believe that with the proposed system the awards can be resurrected stronger and better with more credibility and transparency and therefore acting as a benchmark for other electronic voting systems and other related research in a similar field.

Key words: online, voting and system

Background of Study

Electronic voting systems (online voting) for elections have been in use since the 1960s when punched card systems debuted. Their first widespread use was in the USA where 7 counties switched to this method for the 1964 presidential election. The newer optical scan voting systems that allow a computer to count a voter's mark on a ballot (DRE voting machines) which collect and tabulate votes in a single machine, are used by all voters in all elections in Brazil and India, and also on a large scale in Venezuela and the United States. (Electronic voting, 2021)

On the African continent, a majority of the countries still use manual voting systems and as a result, disputes in election outcomes are common often leading to unrests, mass protests and wars due to bungled elections (A Secure end to end verifiable e-voting system, 2019), Namibia in 2014 became the first country in Southern Africa to conduct a national election using electronic voting, the introduction of Electronic Voting into the Namibian elections first started being discussed in 2004 by the Electoral Commission of Namibia and other relevant state institutions started working on draft legislation paving way for the Electronic Voting implementation, The use of was first introduced in the Electoral Act of 24 of 1992 in 2009 to pave the way for the introduction of the Electronic Voting in Namibia.

Received: 11.11.2023

Accepted: 16.11.2023

Published on: 30.11.2023

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This effort gained momentum following challenges faced in the counting and tabulation processes in the 2009 elections, which led to a delay in the announcement of the election results. The Electronic Voting were first put to use in four local elections in August 2014 and in one by-election in November the same year, before being rolled out in the General Elections of 28 November 2014 (ECN Operations, Systems & Processes, 2017)

In Kenya in particular, bungled elections such as the 2007 general election did unwarranted damages to this promising country Elections up to then had been purely manual and needless to say, the country had witnessed an elongated list of challenges top among them electoral malpractices and rigging that for a long time haunted the electoral process in the country. In 2013 and 2017 however, the country begun making baby steps towards use of e-voting systems although the country is yet to witness a fully automated electoral process that is wholly run using an E-voting system (A Secure end to end verifiable e-voting system, 2019)

In Uganda every after a year the PAM awards are organized with the idea and motive of voting and there by acknowledging the best Ugandan artists in the past 12 months in all musical and creative arts categories from as small as the upcoming artist of the year to the best artist of the year being inaugurated in the year 2003 with pastor George Okudi as the first artist of the year which was the biggest award in the awards and Iryn Namubiru the last winner in the year 2011 (karungi, 2018). The voting is carried out by the fans and followers of Ugandan music in Uganda and all over the world people participate in the voting which is carried out electronically with every person worth one vote.

The voting was set to be manual where two different bodies that is, **Panel of judges** and the **General public** cast their votes for a single winner in each category, The panel of judges is made up of **nine people** from different institutions that constituted for **60%** while that of the public (through SMS) forms **40%** of the total vote per category and was also responsible for resolving any queries or abnormalities that may arise from the nomination process.

Therefore, the main goal of the study aimed at developing and implementing a web-based voting system for the PAM awards replacing the old voting system that largely led to the collapse of the PAM awards in the first place. The proposed system is a multi-user system, developed using Java programming language with Apache Tomcat Server and MySQL DBMS (Database Management System) support. The voting was set to be manual where two different bodies that is, Panel of judges and the General public cast their votes for a single winner in each category, The panel of judges is made up of nine people from different institutions that constituted for 60% while that of the public (through SMS) forms 40% of the total vote per category and was also responsible for resolving any queries or abnormalities that may arise from the nomination process.

Problem Statement

The PAM awards were set up to award every musician in their capacity acknowledgment from their fans for their immense efforts they have put in to release good music for their audiences both local and international. However, cries of foul play started to be raised when specific artists started to be excluded from the overall voting process, corruption,

Received: 11.11.2023

Accepted: 16.11.2023

Published on: 30.11.2023

malpractice, drowned out entirely by fraud, it used to take a huge amount of time to count the votes before declaring the results, The cost of expenditure on the paper ballot is way higher than on Electronic Voting, the greatest challenge is that one could never use historic reference in this case. (World Blaze, 2021). At the time the number people with phones and computers that could be used to send messages was also limited (Newvision.co.ug/news, 2019). With the proposed E-voting system to the PAM awards, The Elections will be done online such that there is no need to come at the physical premises on the time of elections and the public can vote from their homes, offices, places of work and from any other place. The implemented system will allow the public to vote at any geographical areas and at any time by using the proposed system.

Specific Objectives

1. Reviewing the previous voting process or approach in PAM awards
2. Designing an online voting system that is robust and one that uses the new technologies.
3. Developing and implementing the online voting system that is robust and uses new technologies for voter verification and result computation.

Methodology

Research design

The study used a qualitative survey research design to provide a more comprehensive picture of each aspect of the study. A research design is a detailed outline of how an investigation took place (scribbr, 2020). The study also used a survey research method, which was a non-experimental, descriptive research method. Surveys were useful when they wanted to collect data on phenomena that could not be directly observed. Other advantages of the survey were; it was economical, and allowed a collection of a reasonable amount of data from the study population, and also facilitated standardization of the data collected and a disadvantage of the survey method was its artificiality (usfweb, 2011).

Received: 11.11.2023

Accepted: 16.11.2023

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Context diagram of online voting system

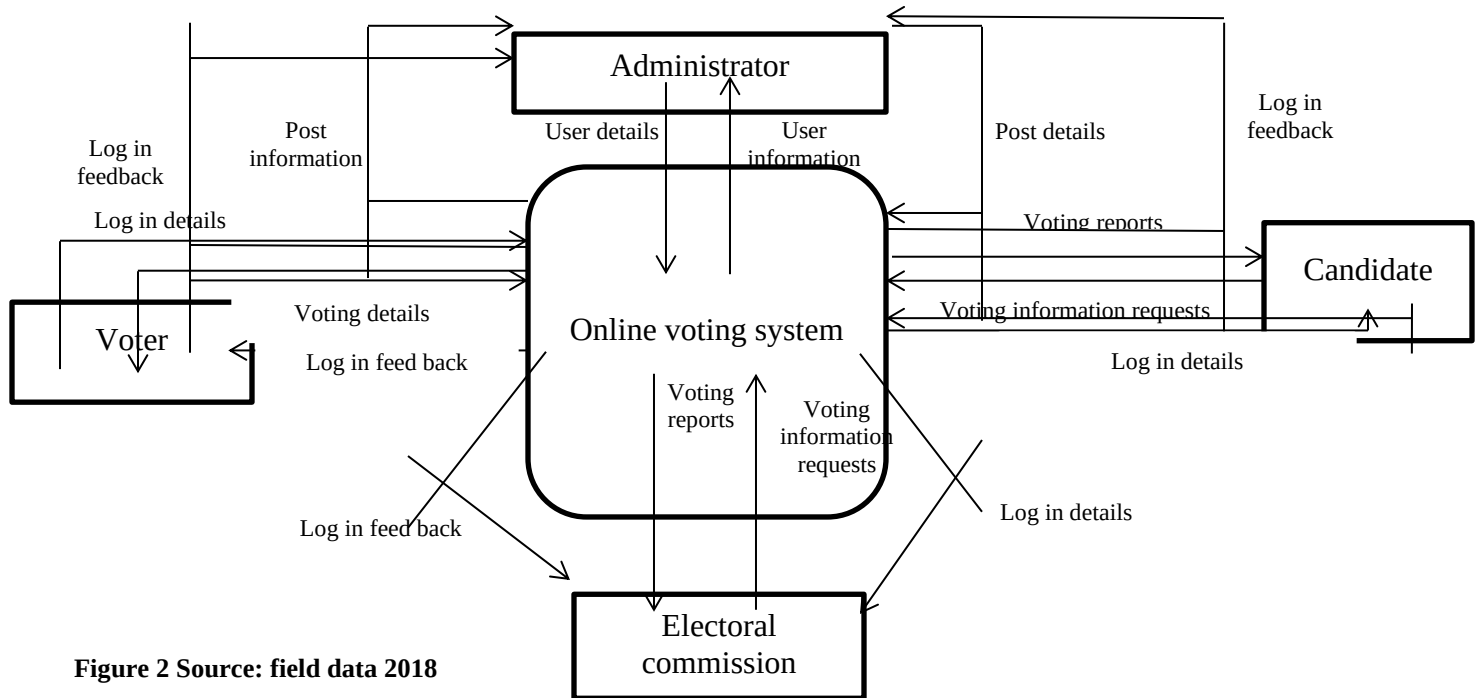


Figure 2 Source: field data 2018

Study Population

The target population contained members of a group that were interested in studying and the results of the study were generalized to this population, because they all had significant traits in common. To identify the target population, I specified the criteria that determined which individuals were to be included and which individuals were not to be included. They considered a portion of the population to which they had reasonable access; a subset of the target population (springer, 2011). For example, respondents were from Uganda city. Therefore, I identified 270 individuals from whom the sample size was got as shown in table 1.

Sample Size

A sample is the actual group from which data is collected (Shahrokh & Dougherty, 2019) and it is a subset of the population and should be a typical representation of the larger group. At least 30% of the total population is representative (Shahrokh & Dougherty, 2019). Thus, the study was conducted on a convenience sample of eighty-four (84) respondents, who included both 75 voters and 9 staff (that is, EC officials at Uganda city) formed the sample of the study. The target population was selected because it was central and pivotal to the topic under study and because of that, I was in position to obtain the relevant information to the study. The sample size was adequate enough to generate unbiased results.

Table 1: sample size

Received: 11.11.2023

Accepted: 16.11.2023

Published on: 30.11.2023

Respondents	Number	Sample Size	Sampling Technique
Musicians	10000	100	Purposive
Voters	50000	200	Simple random
Presenters	100	10	Purposive
Total population	60100	310	

Source: Primary data (2016)

Sampling Techniques

Sampling was concerned with the selection of a subset of individuals from within a statistical population to estimate characteristics of the whole population (Shahrokh & Dougherty, 2014). For this study, purposive sampling technique was used so as to gather the necessary information from the staff. This enabled me to select the respondents basing on their ability to provide relevant and dependable information. This sampling design was used because it enabled me to obtain real facts on the study under investigation since only respondents who with information on the topic under investigation were purposely sampled. Simple random sampling technique was also used to collect information from voters (Sekaran & Bougie, 2013). This technique had high generalizability of findings; hence it was suitable for a large study population. The researcher allocated a number to every online respondent of the accessible population, places the numbers in a container then picked numbers at random. The subjects corresponding to the numbers picked were included in the sample.

Data Analysis

The data was analysed and interpreted using excel spread sheet, which was easier to use. The patterns of the results were used to highlight the key features of the designed framework. Excel was easy to use and could enable me to generate results of analysis in form of bar graphs and statistical tables. To analyse qualitative data, I organized statements and responses to generate useful conclusions and interpretations based on the research objectives (Sekaran, 2003). Qualitative data analysis for the study objectives involved analysis of themes of interview data. Interview response were reviewed, sorted and classified into related themes. Once the themes were established, data was evaluated and analysed to determine consistency, credibility and usefulness of the information to support the qualitative data requirements for the study. To analyse quantitative data, values were entered in excel corresponding to different variables on the questionnaire. Results of analysis were presented inform of bar graphs and statistical tables.

System Analysis and Design

The online voting system was designed based on the functional and non-functional requirements which described the parameters and the data that were incorporated into the system. I used DFDs (context diagram and level one data flow diagram) and entity relationship diagram (ERD) to model the conceptual design of the system. According to Dillman

Received: 11.11.2023

Accepted: 16.11.2023

Published on: 30.11.2023

(2012), DFDs and ERDs were used because they are easier to understand by technical and nontechnical audiences; provided a high-level system overview, complete with boundaries and connections to other systems and provided a detailed representation of the system components.

System Design Approach

I used an agile software development model and follow the systems development life cycle (SDLC), which composed of a number of clearly defined and distinct work phases, to plan for, design, build, test, and deliver the online voting system. (Jacobson et al, 2008) assert that agile development model is a type of Incremental model. Therefore, unlike other software development models, such as the waterfall model, I will use agile model because very limited planning will be required to get started with the project. Agile assumes that the end user needs are ever changing in a dynamic business and IT world (Jacobson et al, 2008).

System Implementation

The online voting system was implemented using the following technologies;

1. Hyper Text Mark-up Language (HTML) for front end. JavaScript will be used to develop the modules of the online voting system since it is an object-oriented programming language. Its ability to display information in the browsers also enables users to use the system.
2. Cascading Style Sheet (CSS) was used in formatting the user interfaces of the online voting system.
3. Hyper-Text Pre-Processor (PHP) that was a server-side scripting language used in connecting the front end to the back end of the online voting system.
4. Bootstrap was used for responsiveness of the online voting system.
5. My Structured Query Language (MySQL) for the backend [Database].

System Testing and Validation

The online voting system was tested by me, using sample data, on the basis of error rates to verify that it met design requirements. Thereafter, the online voting system was taken to the users for validation to ensure that it operates to their satisfaction. Testing will be done before and after the online voting system is put to use. It will be done in phases.

- i) Unit Testing: Unit testing was carried out on individual modules of the online voting system to ensure that they are fully functional as separate units.
- ii) Integration Testing: I carried out integration testing after the different modules are integrated to make a complete system. Integration testing was carried out to ensure that the modules are compatible and that they can be integrated to form a complete working online voting system.
- iii) User Acceptance Testing [UAT]: I will further carry out user acceptance tests to check for any errors that could arise.

RESULTS

Received: 11.11.2023

Accepted: 16.11.2023

Published on: 30.11.2023

System study

From the data gathered about the existing system was, a manual system was used for voting, computing the results and storing data. The system was found to result to malpractices, corruption and time wasting which led to people losing interest in the practice and the artists also lose confidence in the entire process of awarding them hence resulting into their collapse.

Weakness of the current manual system

The following weaknesses were identified about the current manual system. The system was time consuming and slow due to the manual data capture methods and tools involved because it required storage of records on paper which still needed to be compiled.

The system had duplication of records (votes) due to the fact that it was insecure.

The system was highly prone to loss of data since paper -based filing of data has the weakness of being misplaced if not well managed. Further still fire was a great threat to the information kept since very many files are paper based and no fire proof and filing cabinets exists.

The system did not cater for illiterate voter who felt left out due to lack of knowledge of using phones.

The system was also expensive to the voters who had to transport themselves from their residential places to the voting premises.

Strength

Although the manual system has its problems to different users such as agents and members, after gathering, studying and analysing information about the present system, the following were established as its strength:

The manual system was simple and easy to understand since it needed no computers to operate.

The current system was not prone to malware such as viruses, worms and Trojan horses meaning the data stored was not prone to malware.

The manual system was cheap to put in place since papers were readily available hence this eased the availability of resources.

The system was popular to many fans, agents, and administrators therefore the proposed system had no room for better understanding when in use.

User Requirements

A number of artists, administrators and of some of the voters were approached by the researcher during the system study and were asked how and what they would need the system to be and the following were the findings:

The system should be easy to learn and adopt.

The system should be fast in producing results thus reducing processing time and increasing user productivity.

The system should improve efficiency of information storage and retrieval.

Received: 11.11.2023

Accepted: 16.11.2023

Published on: 30.11.2023

The system should allow users take a few steps to get done with any task.

The system should have an element of consistency especially the interface.

The system should have an element of error validation. That is, a system that would detect a user entering unusual commands or data format that is inconsistent with the database.

The system should provide attractive interfaces with easy navigation throughout the system.

Functional requirements

These are requirements necessary for the system to function efficiently and effectively and they include the following;

The system should be able to add, delete and edit voter.

The system should be able to add and edit a candidate.

The system should enable Voter to register as members before they vote.

The online voting System should also enable voters to know whether his/her voting process was successful

The system should show the list of candidates to be voted for.

The system should allow the administrator to upload new information about the voting process.

The system should also compute the number of votes scored by every candidate.

The system should be able to show the total number of voters registered, those who voted and those who registered but did not vote for any candidate

Non-functional requirements

These are requirements that do not affect the functionality of the system and among them include;

The system should allow user access restrictions through a username and password.

The system should be fast enough to satisfy the user.

User interface should be as simple and intuitive as possible.

User interfaces should provide data validation against user input.

System specifications

The system requires various hardware and software so that it is compatible with a variety of computers and runs smoothly without any errors. Therefore, research was carried out and the following software and hardware were recommended:

Table 2: Showing software specifications for the system

Software	Minimum system requirement
Operating system for the client PCs	Windows XP and later versions, Vista/Linux or any server windows and server 2005.
MySQL Server	Version 5.16 or higher database
Database	Apache 2.4.9 as web server

Received: 11.11.2023

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Web browser	Google chrome, Mozilla fire fox, opera mini and Microsoft Edge
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Table 3: Software specifications

The hardware specifications for the system are described in the table 4.2 shown below

Hardware	Minimum system requirement
Processor	Intel Pentium II or above
Processor speed	800 MHZ or above Memory 128 MB RAM or above depending on the Operating system.
Hard drive	1 OGB or above

Security Requirements

Before members can book a ticket, they have to create an account with the system with a unique username. Until then they can only access limited sections of the system such as viewing available events. The system particularly does not accept blank fields or non-valid input. The system has a unique login section for the admin who can view and carry out a series of activities. Users can logout at any time they fill like since there are provisions for such on any authorized page.

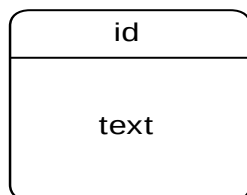
System Design

Data Flow Diagram

A context Data Flow Diagram (DFD) graphically represents the data “flow” of online Event Ticketing System. DFD shows the interaction between the system and entities. Data flow diagrams are commonly used during problem analysis and it views a system as function that transforms the given input into required output. Movement of data through the different transformations or processes in the system are shown in Context Data Flow Diagram.

Process

A process is a task performed by the system. A process has one or more data input and produce one or more data output



Received: 11.11.2023

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This system involved various processes which included

1. Admin registration
2. Calculates votes
3. Registers voter
4. Registers Candidate
5. Logins

Data flow

Data flows show the flow of data in the system and are represented by lines connecting system components. An arrow indicates the direction of flow and the line is labeled by name of the data flow.



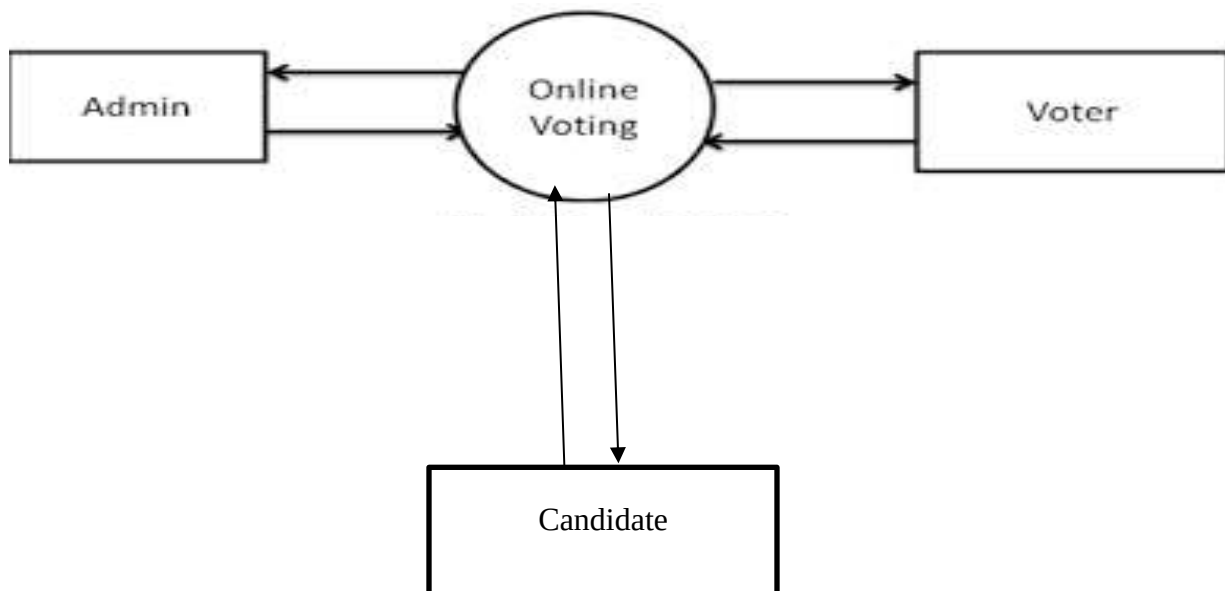
Data store

A data store, a place where data is held between processes.



The DFD displayed in figure 1 below has two entities in to the system that include the staff for performing administrative roles, users which include the administrators and voters who may need to access the system for information and other tasks. The data flow diagram uses different symbols which include;

Figure 2 Context flow Diagram for Online System

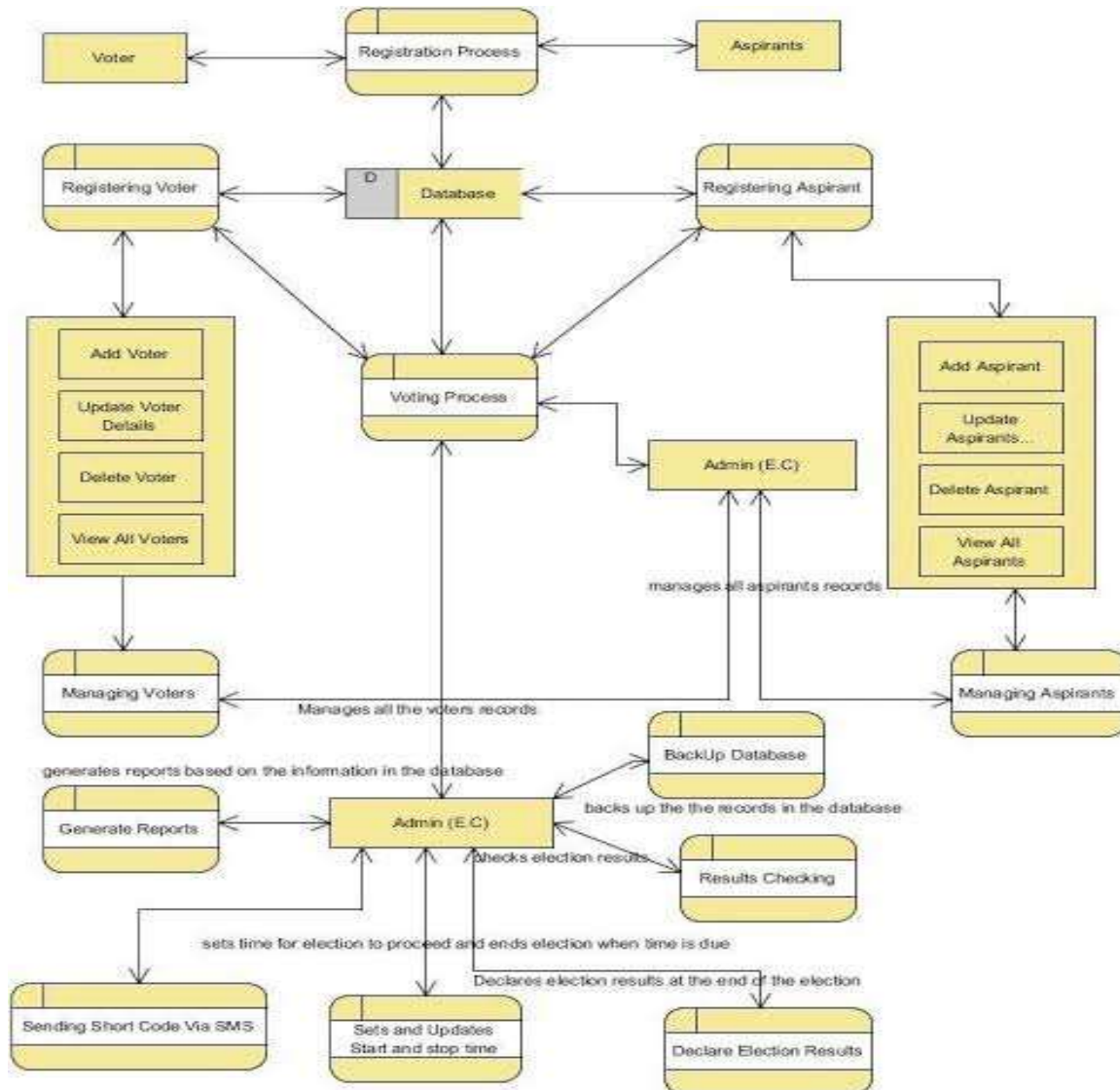


Received: 11.11.2023

Accepted: 16.11.2023

Published on: 30.11.2023

Figure 3 Level 1 Dataflow Diagram for online voting system

**Entity**

This is a source of data or a destination for data.

Table 3: Administrators

Entity	Attribute	Data type
Administrator	User_id	Int
	Name	Varchar

Received: 11.11.2023

Accepted: 16.11.2023

Published on: 30.11.2023

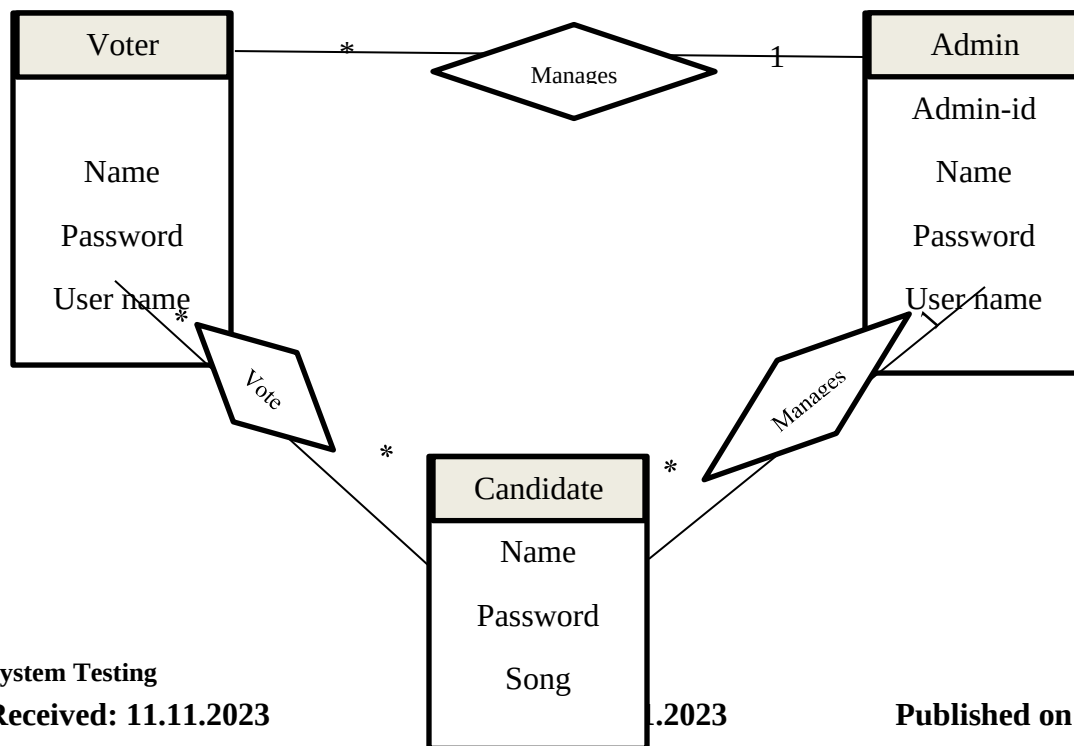
	Password	Varchar
	Username	

Table 4: Artist

Entity	Attribute	Data type
Artist	Name	Int
	Username	Varchar
	Password	Varchar
	Song	Varchar

Table 5: Voter

Entity	Attribute	Data type
Voter	Voter_id	Int
	Name	Varchar
	Username	Varchar

Figure 4 Showing the Entity relationship diagram for the Online Voting system

System Testing

Received: 11.11.2023

.2023

Published on: 30.11.2023

Testing is the process of running a system with the intention of finding errors. In this project, testing was done to enhance the integrity of a system by detecting errors in the system.

Functional testing was used which involved ensuring that the functionality specified in the requirement specification worked accordingly

Conclusion

The researcher was able to discover and distinguish the weaknesses of the manual voting system that was being used by Pearl of Africa Music Awards.

An automated Event Ticketing system was designed to track the events and tickets information and improve on the response rates of bookings tickets.

Misplacement and loss of files, delayed responses, and insecurity of employee information will be reduced, hence improvement of data security and confidentiality. However, there is need for an additional initial cost for implementing the software application and training the staff and the purchase of network devices, but all in all the project successfully achieved its objectives.

Recommendations

The researcher recommends that in the future if other researchers have interest in an online voting system development, this project should be a starting point.

The Researcher recommends to train the users of the system on how to use it and privately keep authentication details that is; the User name and password well to avoid unauthorized access.

In future, additional functionality should be made on the system to cater for improvements in using the online voting system.

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Received: 11.11.2023

Accepted: 16.11.2023

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