

DEVELOPMENT OF AN E- VOTING SYSTEM

By

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Dissertation submitted in partial fulfillment of
the requirements for the
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CERTIFICATION OF APPROVAL

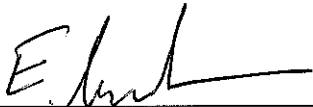
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A project dissertation submitted to the
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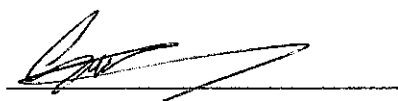
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May 2008

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

A handwritten signature in black ink, appearing to read 'Sara', is written over a horizontal line.

Sara Azhari Hassan

ABSTRACT

With all the new and improved technologies, Internet can be accessed almost from any where. This includes requesting information, shopping and even working from home. The developed system is a system that utilizes the advantages of Internet to eliminate the obstacles that face people while performing election. Nowadays young people have different interests that are mostly have nothing to do with politics and national issues, having such system will also help to increase the political awareness among young people. Voting is a legal right to every citizen who is 18 years old or above. Many people can not practice that right for the reason of being away while elections take place or other reasons. The developed E-Voting System would have the required functionality and security that enable citizens to vote from their home any time they want during election period. The system encompasses some features that are meant to enhance security and increase system's reliability. This system will be a good tool to insure democracy and integrity of elections.

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CHAPTER 1

INTRODUCTION

1.1 Background Study

Voting and elections are essential ingredients of modern communities. Unlike any other transactional event, the result of elections can have many positive and/or negative effects on these communities and their wellbeing. For many years, elections, in general, have suffered from declining participation rates due to the inconvenience of manual voting. Manual voting has several other drawbacks among which are inaccuracy in ballot counting and the delayed announcement of election result. To overcome these drawbacks, the Electronic Voting (e-voting) technique, the use of computers or computerized equipment to cast votes in elections, has been proposed. E-voting automates and simplifies the election process, speeds it up, increases participation rates, reduces counting mistakes and minimizes the time it takes to announce results.

Elections, in general, can be divided into two main types, namely, political (e.g. legislative and municipal types of elections) and non-political (e.g. election of student body within a university). Both of these election types have different security requirements. While high security is needed by political elections, a considerably less amount of security is needed by the non-political ones. Different electronic systems have been proposed in support of elections and voting, namely:

- Computer Counting, where users have to vote on papers where the counting process done by computer
- Direct recoding electron voting machine. Users vote using a keyboard or a touch screen in a computer terminal that is located at the election

center. In this type of voting, users are still required to go to election centers to cast their votes. A storage system is attached to the computer. All votes are immediately placed there.

Online voting, this type of voting requires the use of Internet or private network to be connected to computers where users vote. On-line voting can be conducted in a variety of ways, namely:

- **“Poll site” e-voting system:** this type of voting systems requires voters to go to staffed polling sites and use computers to cast their votes. A network (Internet or private) is used to transfer ballots from each polling place to a centralized site, where votes are tallied and election results are published.

- **“Kiosk” e-voting system:** this type of systems allows voters to vote from computers/ATM-like machines situated within kiosks. The kiosks are setup by the voting authority in suitable locations such as post offices or shopping malls and connected to a central location via the Internet (or a private network). A vote casted at the kiosk will immediately be forwarded across the network to the centralized tallying site. The kiosks are not monitored by poll workers at all time and may allow voting over a period of several days or weeks. Once the voting period for a given election is up, the associated tallying site publishes the result of that election.

- **“Remote” e-voting system:** this type of systems allows voters to cast their votes from any computer or digital device connected to the Internet or to a private network; typically from home or at work. Devices such as personal digital assistance, mobile phones and even game machines may access these systems.

Several studies exist on using computer technologies in support of political remote e-voting systems. Most of these studies have focused on assessing the vulnerability of this type of systems to vote-tampering and illegal access. Other studies have concentrated on developing techniques to insure the security, privacy and integrity of this type of voting systems.

1.2 Risks and Benefits

1.2.1 Advantages of using E-voting system

- The machines can switch to a language of the voters choice, and in culturally diverse countries that will be a necessity.
- Machines can easily be adapted for use by the blind
- Votes are counted instantly allowing quick responses
- Would attract abstainers and include all potential voters

1.2.2 Disadvantages of E-voting system

- Smart cards could be emulated, allowing multiple votes
- E-votes could be intercepted
- The system could go down, losing all votes and information
- “Hackers” could penetrate the system and alter or delete votes that have been cast.
- Without a print out record of a persons vote there is no proof that they have voted
- Manufacturers of the machines could tamper with the code and alter election results

It is true that there are many benefits of having an e-voting system, but the benefits will only be enjoyed “if the confidence of the people has been gained”, (Thomas. W. Laur).

1.3 Problem Statement

1.3.1 Problem Identification

Election process is long complicated process; it is also too sensitive to mistakes. With the increasing number of population and the complex life we live today this process is getting even harder. In order for governments to conduct accurate and fair election they need a reliable and accurate system.

1.3.2 Significant of the project

This project will be focusing on the study, designing and implementing a prototype of the E-voting system. After the completion of this project, it will be beneficial for local governments or organizations (mostly large corporations) as the system is aimed to enhance the election process after its implementation.

The project is significant in the fast changing environment nowadays since it could reduce the efforts made in traditional voting. It also expected to enhance accuracy, privacy, convenience, flexibility, as well as mobility.

1.4 Objectives

The main objectives of this system are:

1. To develop a new system that can be used as a reliable tool for elections.
2. Migrate from manual to computerize system to reduce paper based work, time constraint, and workload.
3. Provide a user friendly platform. Research shows that number of click required directly affect response rate.

This project also has a social objective; it aims to achieve an improvement of the democratic process by increasing voter participation and thereby increasing the number of votes. On-line voting should lead to an increase of citizens taking part in numerous types of elections. The system is expected to evaluate to what extent on-line voting influences voter participation.

1.5 Motivations

- 1 The number of Internet connections had been growing over the previous years.
- 2 Few countries' laws already allowed the attempts of electronic voting.

1.6 Scope of the study

E-voting System is an electronic solution for local elections. The main purpose of having this system is to assist the local government and large corporations to conduct and process elections easily. Among the functions of the system are:

- i) Data insertion
- ii) Posting Announcements
- iii) Provide basic analysis
- iv) Candidate Registration
- v) Citizenship verification

The system will be applied for Sudanese Presidential Elections.

CHAPTER 2

LITERATURE REVIEW AND THEORY

2.1 Concept of E-voting

E-Voting is a short form for Electronic voting. It is a term used to describe various techniques of voting that evolve the use of electronic equipments.

Electronic voting is any voting method where the voter's intention is expressed or collected by electronic means. There are considered the following electronic voting ways.

2.2 Conception of the user and Computer in E-government

2.2.1 Who is the user

Much of the existing research into involvement of the user in the design process assumes that the user is typically an employee in the workplace, but in e-Government, the user is not within an organization but is both a customer of a service and a citizen. At the same time, public sector employees, who traditionally have performed some of the tasks which electronic systems enable citizens to do for themselves, are also users of the system. What is needed is a perspective on the overall system, which does not make assumptions about the users but rather attempts to identify the "clients", as well as various other kinds of stakeholders.

2.2.2 *What is the computer?*

2.2.2.1 *What is the computer?*

In E-government when we say “computer” we are not referring to the single machine. We either refer to a classic mainframe or a personal computer on a desktop. The system within which the computers are situated, are not bounded by the particulars of the technology.

2.2.2.2 *What is the interface?*

Most of the time system developers concentrate on the interface for it is an essential part of the system especially when dealing with non expert users. Sometimes, as in Suchman’s ground-breaking study, a study of the interface illuminates usability problems whose origin lies elsewhere; as computers become increasingly ubiquitous, though, it is increasingly the case that users’ interactions are not at a single interface or, indeed, that they may “interact” without being consciously aware of the interaction.

2.3 Voting Machines

There are so many articles in the Internet that criticize electronic voting systems. Most of the published reports are about the level of security of the electronic voting systems

According to Dr. David Jefferson, Dr. Aviel D. Rubin, Dr. Barbara Simons and Dr. David Wagner:

“voting systems have been widely criticized elsewhere for various deficiencies and security vulnerabilities: that their software is totally closed and proprietary; that the software undergoes insufficient scrutiny during qualification and certification; that they are especially vulnerable

to various forms of insider (programmer) attacks; and that DREs have no voter-verified audit trails (paper or otherwise) that could largely circumvent these problems and improve voter confidence. All of these criticisms, which we endorse, apply directly to SERVE as well. But in addition, because SERVE is an Internet- and PC-based system, it has numerous other fundamental security problems that leave it vulnerable to a variety of well-known cyber attacks (insider attacks, denial of service attacks, spoofing, automated vote buying, viral attacks on voter PCs, etc.), any one of which could be catastrophic. Such attacks could occur on a large scale, and could be launched by anyone from a disaffected lone individual to a well-financed enemy agency outside the reach of U.S. law. These attacks could result in large-scale, selective voter disenfranchisement, and/or privacy violation, and/or vote buying and selling, and/or vote switching even to the extent of reversing the outcome of many elections at once, including the presidential election. With care in the design, some of the attacks could succeed and yet go completely undetected. Even if detected and neutralized, such attacks could have a devastating effect on public confidence in elections.”

Some authors had put the blame on the machines.

“The vulnerable machines are those made by manufacturer Sdu. The remaining 90 per cent of the nation's polling computers are made by Nedap. Although Dutch IT professionals in the Netherlands have demonstrated that these types of e-voting machines can also be secretly hacked using a simple radio receiver, the AIVD tested three of the four Nedap variants and determined that there is no real danger of "bugging". Nedap says it is currently installing new microchips and software to prevent hackers manipulating the votes. Additionally, ballot computers for the November elections will be equipped with a "unique iron seal" to guarantee their reliability” (Jan Libbenga)

2.4 Overseas Voting

There are many people who happen to be abroad at the time election is being conducted like in the case of soldiers who are in a mission outside the country. Some governments like in U.S. and Thailand are using the overseas voting system to enable absentee citizens to practice their right of voting.

For the US overseas system, absentee citizens are required to complete and mail the Federal Post Card Application (FPCA) also known as SF76. FPCA is a postcard, printed and distributed by the Federal Voting Assistance Program for the use of absentee citizens. When the application form is received by the local election office, it will be processed for approval. Citizens with approved applications will be mailed the "absentee ballot. Once the ballot is received, citizens are required to vote and mail back the ballot to the election office.

Concerns regarding Overseas Voting:

- There is always the possibility of getting absentee ballots out too late for remote voters to return them in time.
- Efforts to speed things by using e-mail and fax machines pose a risk to voters' confidentiality.

Websites intended to help overseas voters navigate the process are not widely used. A private group's site was taken down earlier this month in a contract dispute

According to Richard Wolf, US Today; "About 3.7 million Americans live overseas, and more than 400,000 members of the military are stationed or deployed overseas. In 2004, Pentagon officials estimate, 58% of Americans abroad voted compared with overall turnout of 60%. Military participation overseas was estimated at 75%".

In some cases, absentees are granted the privilege of collecting a new ballot in case the first one was not received or because it was damaged.

2.5 Kids' Voting

The Kids Voting program was developed in the United States in the late 1990s. Students were encouraged to accompany their parents/guardians to the polling booths on Election Day. Students voted alongside their parents/guardians (for the same candidates), but of course, since these voters were underage, they were not counted. Kids' Voting was also introduced into schools in the Auckland area, New Zealand in 2001 and has been successfully conducted since. Students who were in the program were those of the age of 12-13 year olds. Students vote for real candidates, on a replica

2.5.1 Objectives of the program

- ⌘ Kids Voting increases young peoples' understanding of, and participation in, electoral and democratic process
- ⌘ Increasing the levels of political engagement among young people and working through schools is one way to encourage young people to take part.

2.5.2 Benefits of the program

Kids' voting program has a number of benefits that are:

- ⌘ Students' awareness of the political process is fostered and the practice of voting encouraged.
- ⌘ Participation of students in the voting process encouraged more parents/guardians to turn out to vote.

According to researches made in the USA, the kids who participated in Kids' Voting have:

- ⌘ Long term influence on students
- ⌘ Particular effectiveness for students from low socio-economic backgrounds
- ⌘ Contributed to students initiating political discussion at home, thereby influencing parents, who in turn encourage their children to participate
- ⌘ A strong correlation to registration and voting for first time voters

Contributed to increases to adult voter turnout in Kids Voting communities.

CHAPTER 3

METHODOLOGY

In this chapter, the methodology used for the project development will be described briefly. In the consideration of time and quality of system, evolutionary and water fall methodology was used. The Waterfall methodology was used to gathering the user requirement, feasibility study and analysis of the system. Waterfall model was mainly used in planning and analysis phase. System requirements needed to be proper documented to be used in the next phase of the system development life cycle.

3.1 System Development Life Cycle (SDLC)

Waterfall method applies the linear sequential model process instead of Rapid Application Development (RAD).RAD is an incremental software development process model that emphasizes an extremely short development life cycle. Since the period of Final Year Project (FYP) is nearly 10 months and the development happens gradually, Waterfall model is the most suitable for the development of this system.

Incremental development is applied in this system because the system is big and also because it has a long development period. Using such development model will divide the product into builds, the fact that the system is a multi-function system has to be taken in account.

Waterfall model has a number of stages as figure 3.1 shows. These stages are:

- ⌘ Planning and Requirement Analysis.
- ⌘ Specifications
- ⌘ System design
- ⌘ Implementation

- ∩ Testing, and
- ∩ Maintenance

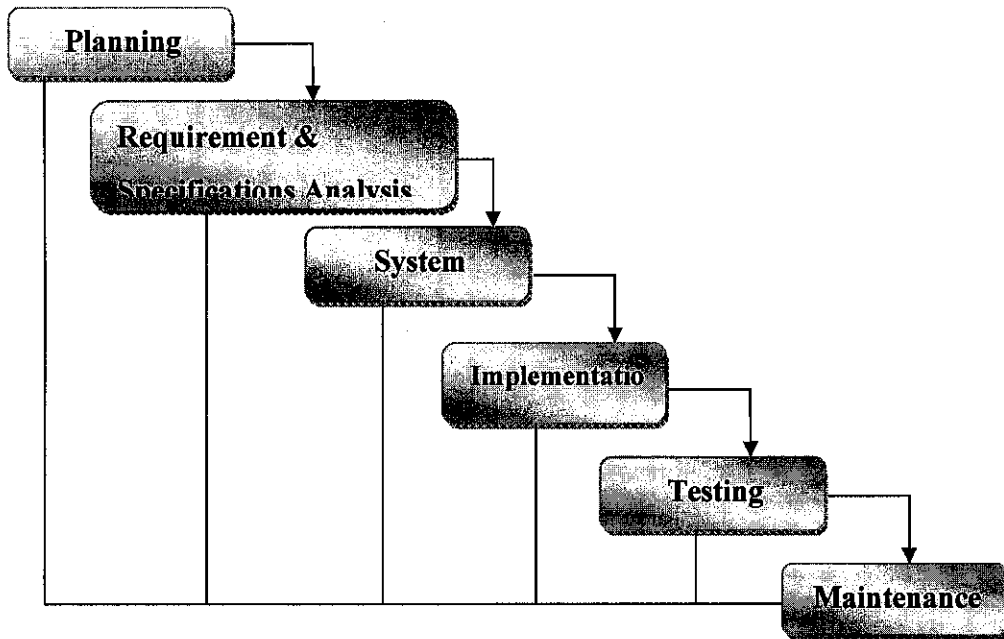


Figure 1: Waterfall Model

3.2 Procedure Identification

There are some advantages of using the waterfall methodology compared to the other methodologies. Waterfall model provides an orderly sequence of development steps that helps to ensure the sufficiency of documentation and design reviews to ensure the quality, reliability, and the maintainability of the developed system.

The disadvantage of this model is that it does not allow for much reflection or revision. Once an application is in testing stage, it is very difficult to go back and change something that was not as desired through out in the concept stage.

Waterfall model consists of six distinct stages, namely:

3.2.1 Planning Phase

The problem domain is specified along with the desired service objectives. Also all possible requirements of the system to be developed are captured in this phase. These requirements are analyzed for their validity and the possibility of incorporating the requirements in the system to be development is also studied. Finally, a Requirement Specification document is created.

The successful completion of this stage the project will result in achieving the system's objectives that has been stated before

3.2.2 Requirement Specification & Analysis Phase

3.2.2.1 Requirement Analysis

3.2.2.1.1 Functional Requirements

- The system has to keep the anonymity of the voter
- System has to be universally accessible
- Allow users to vote within certain constrains
- User Input Validation
- Election result should not be viewable before the end of the elections

3.2.2.1.2 Non-functional Requirements

Availability

The e-voting system needs to be resilient to malicious attacks, and needs to be able to cope with a large amount of concurrent users without crashing.

If this system were used in real life it would require the use of multiple servers to deal with large amounts of users and be able to cope if one server goes down.

Security

It is a very important requirement for a system such as electronic voting system. The system should include controls to prevent manipulation. System is also has to be protected against masquerading, eavesdropping and impersonators.

Performance

The system should be able to deal with concurrent requests and during open polls needs to accommodate for at least 1000 users throughout the day. Generally, any delay in displaying a webpage results on annoyed user who would eventually be timid to use the system.

Usability

The system has to be user friendly, meaning intuitive, easy to navigate and provides help since users varies in age and experience. If a system is not deemed user friendly it's potential depletes very rapidly due to users frustration and confusion.

Scalability

The system will potentially have to deal with up to 3000 votes in one day, (although current paper based turnout is just over 1000, so during busy periods this is probably about four concurrent requests.

Reliability

It is a major concern in electronic voting. To achieve reliability; the system has to be tested and exceptions being caught.

3.2.3 Design phase

System design is the phase where all the functions, features, interfaces and contents are sketched and drafted before the real development is done. The required functions are decomposed into modules and their interfaces. User interface is designed and data structure of each task is specified.

In this stage also, all the design and sketch that have been planned on the previous stages is developed to produce a system that will follow the requirements and achieved the target objectives in order to make the system user-friendly. Below are some steps that have been designed and developed for this stage:

3.2.3.1 Graphical User Interface

i. Web Interface

A web-based interface will be created. The interface will contain all the information needed to achieve the purpose of the system. The interface will be developed using the Macromedia Dreamweaver MX. JavaScript codes will be included to make the interface more interesting and attractive.

ii. Screen design / color

The screen design and color that will be choose is considering the user environment, which is not too colorful and will be design a simple interface screen design. The screen will be developed using the appropriate fonts, font colors, background colors, images, and many more. The planned main interface will have 3 frames that will be divided into two sections, which are

the menus and the system's main page. Flash buttons will be used in order to make the interface more interactive.

iii. Graphics

Graphics are not really necessary for the reason that all the users need are simple instructions and options that is easily demonstrated without the aid of graphics, another reason is that all the system users are above 18 years old

iv. Navigation

Most of the system's users are expected to be novice users, on that base the navigation will be design based on the linear navigational model to provide simplicity and structured the system for user to explore and navigate easily.

3.2.3.2 Module of E-Voting System

3.2.4 Implementation phase

Detailed documentations from the previous phase are used as input in this one.

In this phase, all the system components and elements will be integrated with the functions as well as the navigations in order to produce a complete functional system.

3.2.5 Testing phase

All the program units are integrated and tested to ensure that

the complete system meets the functional requirements. These units are integrated into a complete system during Integration phase and tested to check if all modules/units coordinate between each other and the system as a whole behaves as per the specifications.

3.2.6 *Maintenance phase*

This phase is virtually never ending phase. Generally, problems with the system developed (which are not found during the development life cycle) come up after its practical use starts. Not all the problems come in picture directly but they arise time to time and needs to be solved; hence this process is referred as Maintenance.

3.3 System Overview

The E-Voting system will have two main types of user candidates and voters. Candidates have more access than users yet both of them have limited access. The system is designed to enable users to practice their voting rights by firstly registering and then casting their voice without having to worry about the invasion of their privacy. Passwords for voters are generated by certain governmental organization

3.4 Process Flow

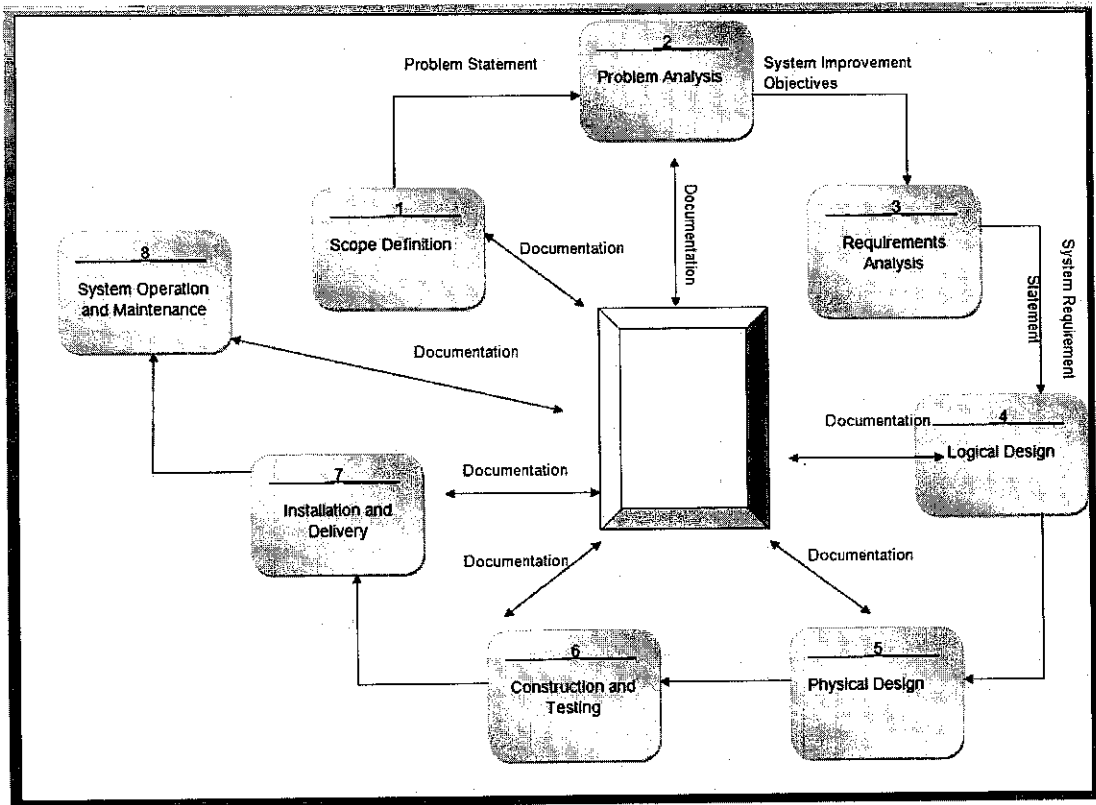


Figure 2: Process Flow

3.5 Schedule of System Development and Milestones

The major deliveries of FYP are divided into two parts, FYP-I and FYP-II which will be outline along with Schedule graphical representation.

3.5.1 FYP-I delivery and time line

FYP-I was the system prototyping that have been completed within duration 14 weeks. To reach the completion of system prototyping, the following was the main phases with the assignment of duration and the gradual deliverable for each phase.

Major phases and deliveries:

- i. Project initiation and proposal

1. Project proposal
2. Feasibility study
3. Preliminary report

ii. Planning and analysis

1. Problem Identification
2. Requirements Engineering
3. Requirements Evaluation

iii. Design phase

1. System architecture design
2. Use case design

iv. Implementation and prototyping

1. System installation and coding
2. Implementation (coding).

Activity	Milestone	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Proposal Submission	August 3, 2007	■													
Proposal Approval	August 10, 2007		■												
Initial study and Preliminary Report				■											
Study and analyze				■	■										
Requirements Engineering				■	■										
Project work continues				■	■										
Preliminary Report Submission	August 17, 2007				■										
Project work continues					■	■		■							
Seminar 1	August 27, 2007					■									
Progress Report Submission	September 21, 2007								■						
Project work continues									■						
Seminar 2	October 1-5, 2007									■					
Project work continues										■	■				
Interim Report Submission	October 19, 2007											■			
Oral Presentation	October 29, 2007														■

Table 1: FYP I Schedule

3.5.2 FYP-II deliveries and time line

FYP-II is the second deliveries of FYP, in this part the work is concentrating on implementing the working prototyping that will be presented at the end of semester. Another major work of FYP-II will be software testing and reliability that need to be carried out to make sure the software reaches the acceptable reliability. The following is the outline and time for completing the FYP-II.

- i. Implementation
 - 1. Implementing Database
 - 2. Implementing signing in function
 - 3. Implementing Voting function

- ii. System Testing
 - 1. Unit testing
 - 2. Integration testing

Table 2: FYP II Schedule

Activity	Milestone	W E E K S															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Project Work Continues		█															
Submission of Progress Report I	February 6, 2008			█													
Project Work Continue				█	█	█	█	█				█					
Submission of Progress Report II	March 19, 2008							█									
Project Work Continue								█	█								
Seminar	March 24-28, 2008							█	█	█							
Project work continue								█	█	█	█						
e-EDX	April 9, 2008										█						
Final Report Submission	April 11, 2008										█						
Final Presentation	April 21-25, 2008												█				
Submission of dissertation	May 16, 2008																█

3.6 Tools Required For System Development

Here are stated the tools that are needed in developing this system:

3.6.1 Software

1. Microsoft Visio 2007

It is one of the most reliable diagramming software. It uses vector graphics to create diagrams. I will be using Microsoft Visio to create Use-Case model diagram Activity diagram, State diagram, Class diagram, and Sequence diagram.

2.WAMP5

It contains PHPmyadmin 2.11.0, Apache 2.2.4 and MySQL.

PHPmyadmin is a powerful tool to manage the MySQL server along with single data base. I will be using it to create, drop, rename and alter my database tables.

WAMP5 will be the server where the system will be running.

3.Microsoft Visual Studio 2005

This tool is used to help developing some of the forms used in the system.

4.Macromedia Dreamweaver MX

This tool is to develop the websites interface and all the function required. The programming language would be HTML.

3.6.2 Hardware

TOSHIBA L100, Genuine Intel ® CPU T2300@1.66GHz
1.66 GHz, 1 GB of RAM

CHAPTER 4

RESULTS AND DISCUSSIONS

In this chapter, all the result and discussion will be briefly present and discuss. The included result in this report will be the first draft of use case diagram and the architecture diagram of the system.

4.1 System Architecture

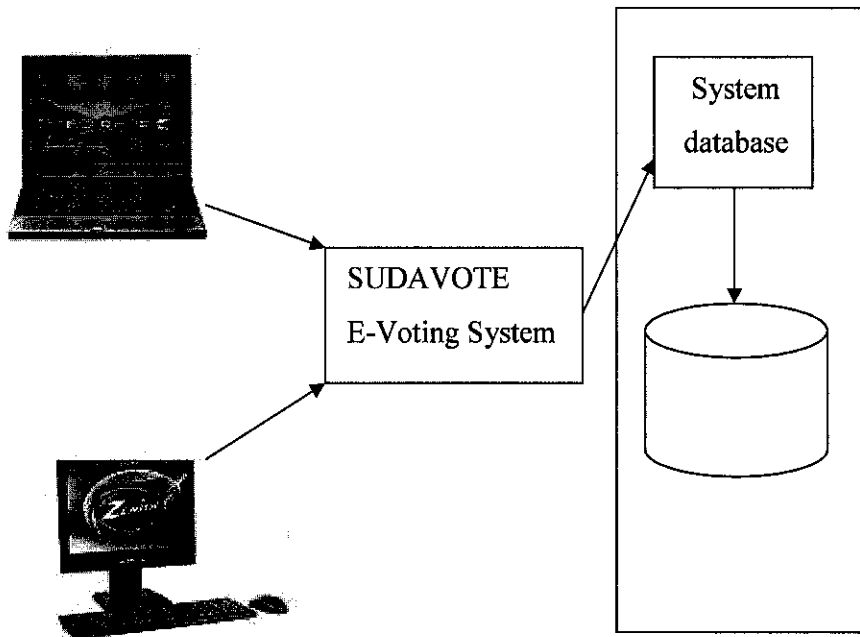


Figure 3: System Architecture

4.2 Use Case Diagram

Use case of the E-voting system was design to demonstrate the interaction between users and the system. There are six use cases, each use case present the core module of the system that will be implemented to provide the required functionality.

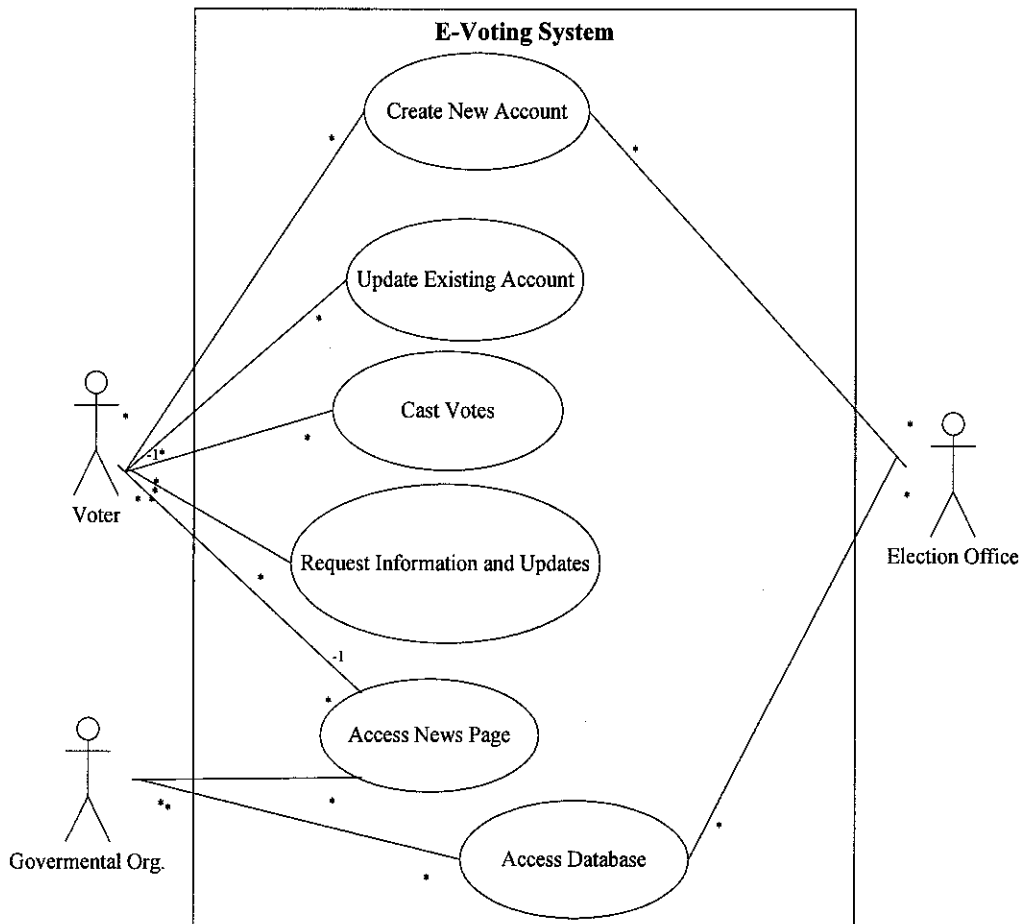


Figure 4: Use Case Diagram

4.3 System Flow

As shown in figure 5. The model starts at the home page. In this page, it presents a brief explanation about the system and some instruction for the system users. It's also the page where users will be required to sign in. Unsigned in users are able to browse through the News page and "Contact us" page.

New users have to start with the **Registration** part. To register users are to fill the registration form. Submitted form should wait for system admin approval. Once the form is approved a user is sent a confirmation email and user account will be activated. Users can also cancel the registration process by clicking the “Cancel” button.

To sign in; users are required to key in their IC Number, Username and password. Entered data will be run against the database if IC Number and username exists and password is correct, the user will be allowed to access the system. Along with the verification of username and password the system will check the other user’s voting status, if user’s vote exists, a message states that “You have voted already you are not allowed to revote, Have a good day”. Signed in users who have not voted before will be allowed to vote. Once a vote is casted, it will be saved in the database.

There is also the **News** section where users have two options; either getting to the updates page when news about the latest news about the elections are provided along with the announcements that are posted by system administrator, or they can browse through the candidates’ biographies.

In the **voting** part the system displays the candidates’ names and photos with a done and a cancel buttons. If the user presses the done button, another page will appear with a thank you message, if the user chose to cancel then the homepage will appear.

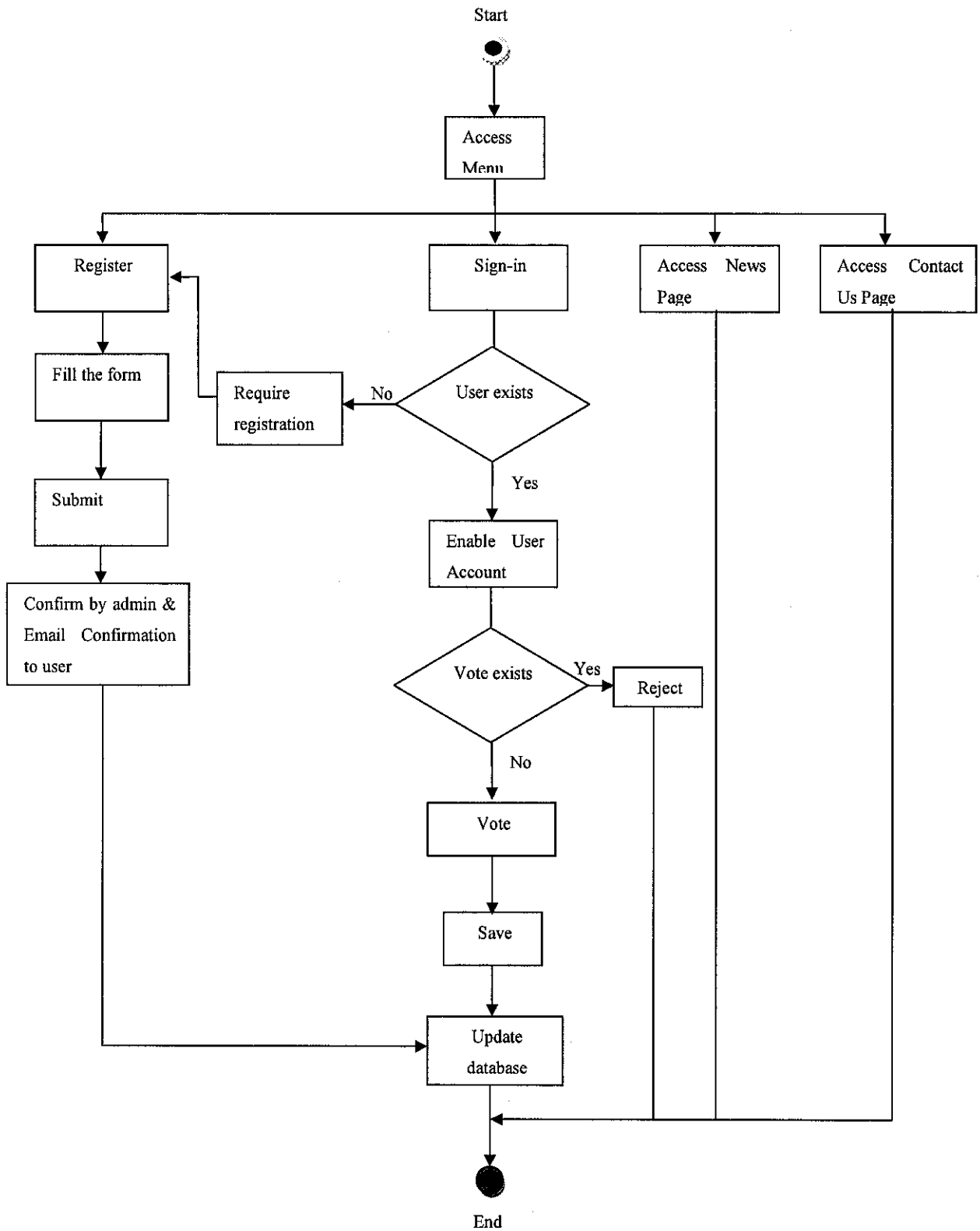


Figure 5: System Flow

4.4 Data Collection and Questionnaire Results

A questionnaire was constructed in order to get information about what prospective users think of the current voting system. It also aimed to explore users' computer experience. Knowing the level of user experience will help in designing system that is usable by different type of user

4.4.1 Questionnaire Results

The questionnaire showed that 79% of the Sudanese citizens living abroad are willing to use the system to practice their voting right. 17% think that they don't need to do so where the remaining 4% doesn't care about election.

The questionnaire also showed that 100% of the participants are capable of handling computer and Internet communication.

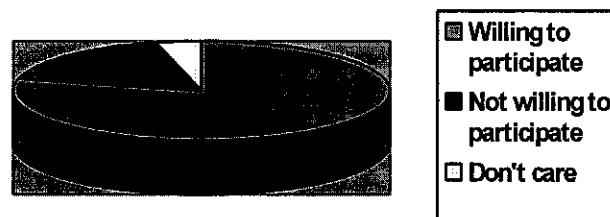


Figure 6: Questionnaire Results

4.5 System Prototyping

This section discusses the system prototyping. This version of prototyping will present the flow of the system, the functionalities, the required input and the expected output.

4.5.1 Login Screen

The system main page displays the system name and uses along with a brief introduction. System main page also includes the login screen.

Next user has to login in the shown screen in figure 6

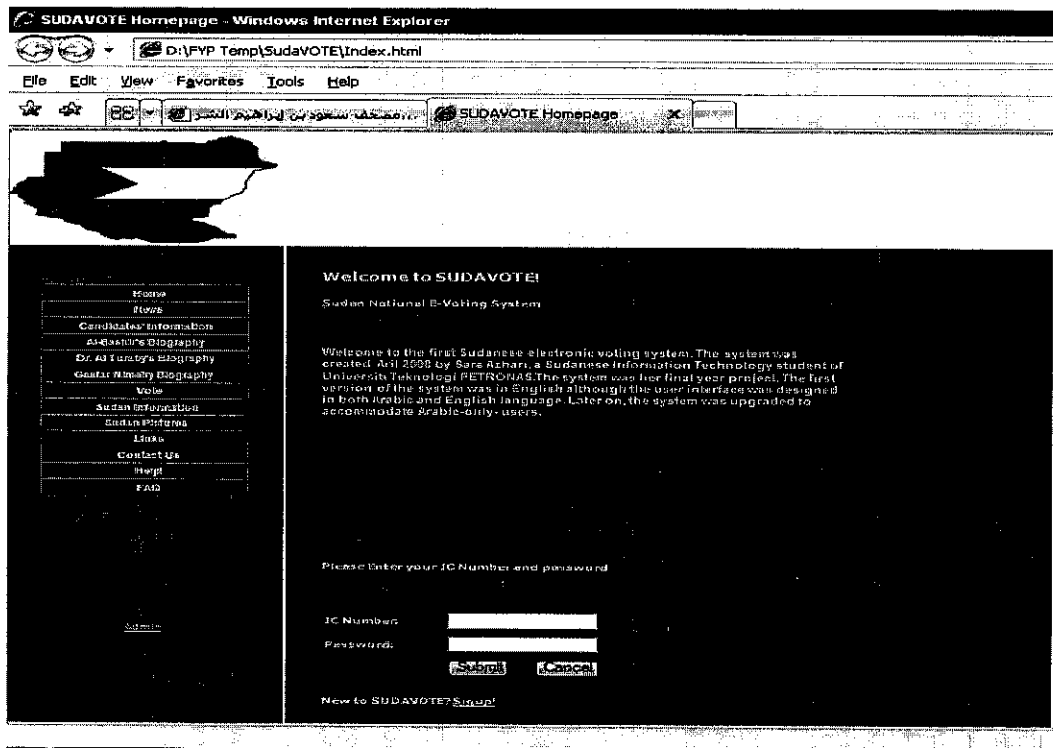


Figure 7: SUDAVOTE main page

A successful login occurs when correct information is entered.

The page also contains the link to the administrator page. When the link is clicked the user will be directed to the admin login page. A successful login happens when the admin username and password are correct.

4.5.2 News Page

A logged in user has the privilege of browsing through the system's pages. News pages contain all the election updates. A biography of each candidate is also included in that section along with their latest news.

The news page is handled by Election Office. It is the only authority that will have access to the system.

4.5.3 Voting Page

On the voting page; candidates' names are displayed along with their pictures. In front of each name there is a Radio button. Radio button was chosen to insure a single choice.

The purpose of using candidates' pictures is to help senior citizens and people with reading problems to vote. See figure

Once a vote is casted the "**Done**" should be pressed, and a confirmation message would appear. Once voting is confirmed, another message would appear

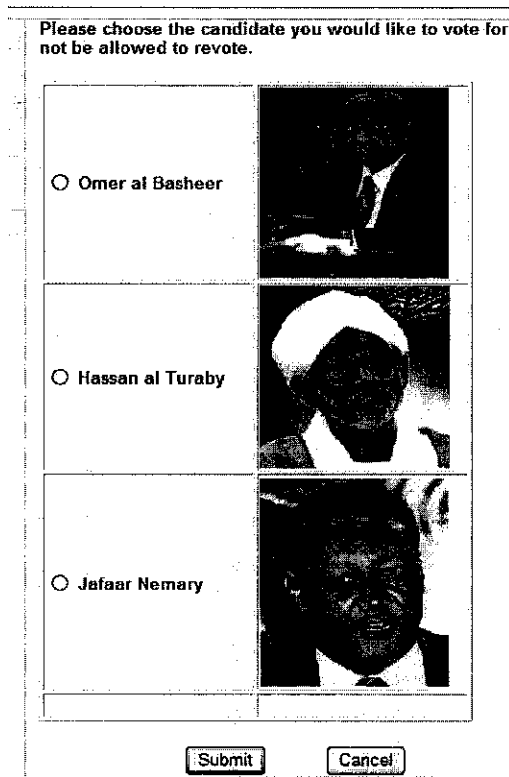


Figure 8: Voting Page

4.5.4 Contact Us

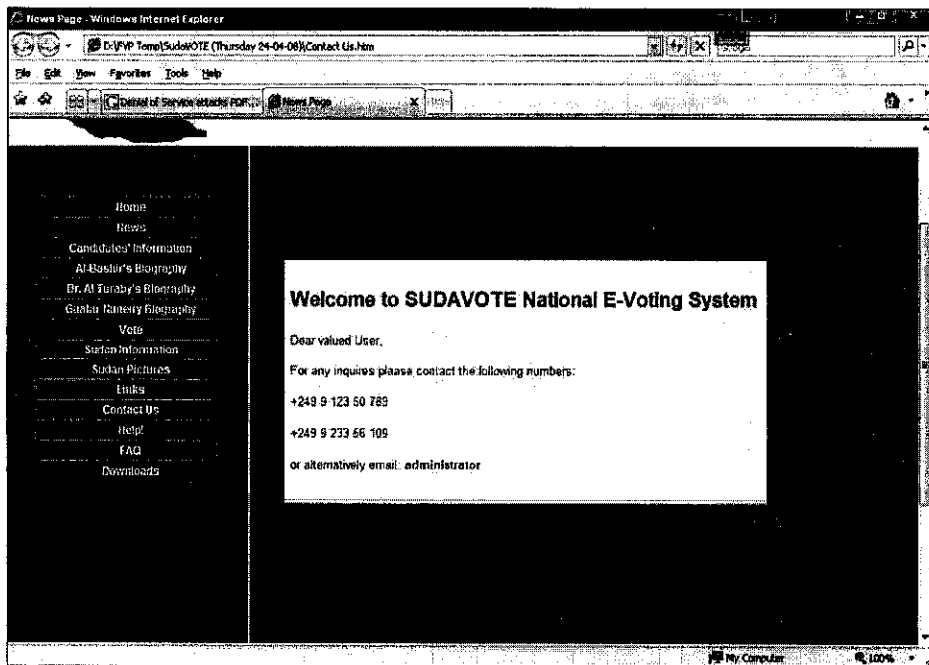


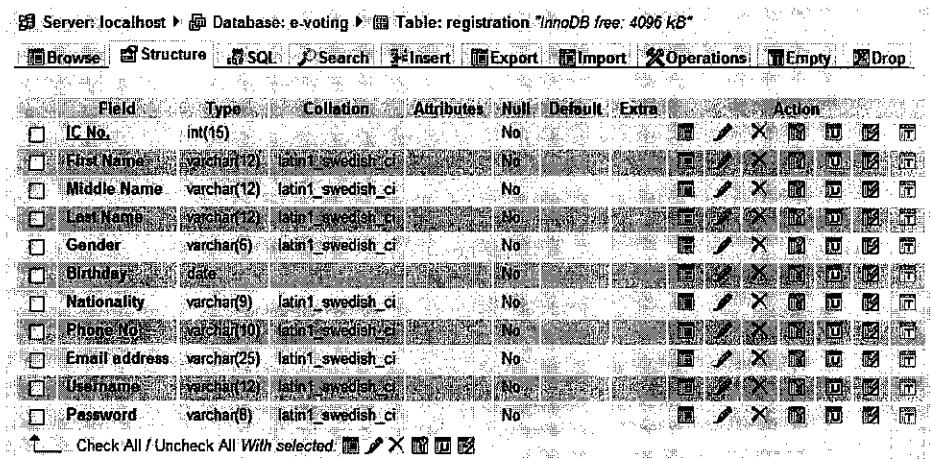
Figure 9: Contact Us Page

4.6 Database

As described earlier, the system database is to be developed using the registration forms that the system's users fill when they use the system for the first time. When a registration form is submitted, system administrator will validate the entered data. The IC number will be run through the ministry of interior affairs' database. If the user details are correct, a confirmation email will be sent to the user and the registration details will be saved to the system database.

Votes, later on, will also be added to the system data base.

Figure 10 shows the registration table in the database.



Server: localhost Database: e-voting Table: registration "InnoDB free: 4096 kB"

Field	Type	Collation	Attributes	Null	Default	Extra	Action
<input type="checkbox"/> IC No.	int(16)			No			
<input type="checkbox"/> First Name	varchar(12)	latin1_swedish_ci		No			
<input type="checkbox"/> Middle Name	varchar(12)	latin1_swedish_ci		No			
<input type="checkbox"/> Last Name	varchar(12)	latin1_swedish_ci		No			
<input type="checkbox"/> Gender	varchar(5)	latin1_swedish_ci		No			
<input type="checkbox"/> Birthday	date			No			
<input type="checkbox"/> Nationality	varchar(9)	latin1_swedish_ci		No			
<input type="checkbox"/> Phone No.	varchar(10)	latin1_swedish_ci		No			
<input type="checkbox"/> Email address	varchar(25)	latin1_swedish_ci		No			
<input type="checkbox"/> Username	varchar(12)	latin1_swedish_ci		No			
<input type="checkbox"/> Password	varchar(8)	latin1_swedish_ci		No			

Check All / Uncheck All With selected

Figure 10: Registration Table

There are six tables in SUDAVOTE database;

Table 3: SUDAVOTE Database Tables

No.	Table Name	Input Source	Primary Key
1	User	Registration form	
2	Admin	Admin	
3	Candidate	Add Candidate form	
4	Vote	Voting.php	
5	Results	Generate result.php	
6	Election	Voting and Result tables	

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

The E-Voting System has been successfully developed. The system should provide convenient services to users. It would be a great help to the Sudanese Government in handling the election process that occurs every four years. The system would perform the assigned tasks with less effort needed from the election office personnel and within short period of time. The system can also be modified to be used for student board elections. By the end of the development process, many experiences and lessons have been learnt. These lessons will –no doubt- be useful in the professional life.

5.2 Recommendations

As an upgrade for the system, a new Arabic version of the system should be added to satisfy the need of only-Arabic language- users.

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APPENDICES

APPENDIX A
SURVEY ON COMPUTER AND VOTING EXPERIENCES

Instructions:

Please provide your personal details then answer the following questions by highlighting your choice.

- Name: _____

- DOB (Date of Birth): _____

*If you don't feel comfortable providing your age please chose an age group

Less than 18 , 18-30 , 31-40 , 41-50 , 51-60 , 61-70

- IC Number: _____

- Occupation: _____

1) How can you describe yourself as a computer user?

1. Expert user
2. Novice user
3. I have no experience with computers

2) How often you use the Internet?

1. Always
2. Sometimes
3. Seldom
4. Never

3) Which one you prefer as an input device?

1. Touch Screen
2. Mouse Click

4) Have you voted in a Sudanese National election before?

1. Yes
2. No

If yes, how many times? _____

5) How do you feel about Sudan current voting system (the manual system)?

1. Good
2. acceptable
3. No good

6) Do you think using an E-Voting system will improve the election process in Sudan?

1. Yes
2. No
3. I don't know

7) Are you a Sudanese who is living abroad?

1. Yes
2. No

8) How important is it for you to practice your right in voting?

1. Very important
2. Not so important
3. I don't care about that

9) How do you feel about being able to vote from outside the country (Overseas Voting)?

1. I like that
2. Wouldn't be bad
3. I don't care

APPENDIX B: SUDAN, BACKGROUND STUDY

Sudan is the second largest country in Africa. It is also the tenth largest country in the world. With an area of 2,505,813 squared kilometers (967,500 squared miles).

Sudan is boarded by nine countries named; Egypt, Eretria, Ethiopia, Kenya, Uganda, Democratic republic of Congo, Central Africa, Chad and Libya. It is also boarded by the Red Sea form. The country officially known as *the Republic of Sudan*

The capital city of Sudan is Khartoum, a huge city that a combination of three cities; Khartoum, Omdurman, and Khartoum North.

Languages of Sudan:

Due to the diversity of Sudan's ethnic, the country has as many as 134 languages (more than 400 if dialects are counted). In addition t eight extinct languages located in Sudan. Among all these languages Arabic is the dominant one. There are several variants of Arabic. The dominant is labeled Sudanese colloquial.

English is the second language of the country. It is also the principle language in the south.

Religion in Sudan:

Sudan is a Muslim country where Muslims making over 75 percent of the total population. According to statistics; Sudanese Muslims are 100 percent Sunni, but this figure may include a very small minority of Shi'is. A common trait of Sudanese Islam is the religious brotherhoods, like Qadiriya, Khatmiya and Tijanya.

There is also a percentage of Christians about 4- 10% of the total population where the rest practice traditional religions.

Sudan People:

The population of Sudan is divided into 19 ethnic groups with 597 subgroups
According to Looklex Encyclopedia;

Table 4: People of Sudan

Group	Number	Percentage of population
Arabs	21,000,000	55%
Dinka	3,000,000	8%
Nuba	2,100,000	6%
Nuer	1,400,000	4%
Fur	1,000,000	2.7%
Zande	660,000	1.8%
Shilluk	600,000	1.6%
Bari	480,000	1.3%
Nubians	200, 000	0.5%
Other people	6,300,000	17%

Sudan Membership:

Sudan is a member of the UN, the Arab League, OAU (Organization of African Unity), and ACP state of the EU and Organization of Islamic Conference

Sudan Currency:

Since January 2007, Sudan had adopted a new currency, Sudanese Pound that replaced the Sudanese Dinar. This step was taken as a part of the peace agreement that signed between the government and the SPLA (Sudan People's Liberation Army).

The conversion rate set by the central bank of Sudan is:

1 Sudanese Pound = 100 Sudanese Dinars

1 Sudanese Pound = 0.5 US Dollar

Sudan Time Difference:

GMT + 3

Sudan Climate:

Tropical in south; arid desert in north; rainy season (April to October), dry cold winter (November to February)

Sudan Natural resources:

Petroleum; small reserves of iron ore, copper, chromium ore, zinc, tungsten, mica, silver, gold

Sudanese States and Districts:

Sudan is divided into 25 states and 133 districts. The states are

1. Al Jazzirah
2. Al Qadarif
3. Blue Nile
4. Central Equatoria
5. East Equatoria
6. Jungali
7. Kassala
8. Khartoum
9. Lakes
10. North Bahar al Ghazal
11. North Darfur
12. North Kurdufan

13. Northern State
14. Red Sea State
15. River Nile
16. Sennar
17. South Darfur
18. Unity
19. Upper Nile
20. Warab
21. West Baghr al Ghazal
22. West Darfur
23. West Wquatoria
24. West Kurdufan
25. White Nile

Khartoum, the Capital City:

Khartoum is the capital of Sudan and of Khartoum State. It is located at the point where the White Nile, flowing north from Uganda, meets the Blue Nile, flowing west from Ethiopia. The merger of the two Niles is known as "the Mogran". The merged Nile flows north towards Egypt and the Mediterranean Sea.

The city proper has a population of well over a million inhabitants, making it the second-largest city in the country, but forms with its neighbours, linked by bridges, Khartoum North (al-Khartūm Bahrī) and Omdurman (Umm Durmān) a metropolis with a population totaling over eight million.

The word 'Khartoum' means 'elephant's trunk' in the dialect which was spoken locally, the name of the town is probably derived from the narrow strip of land extending between the blue and White Niles, which is like the trunk of an elephant. Captain J. A. Grant, who reached Khartoum in 1863 with Captain Speke's expedition, thought that the derivation was most probably from the safflower (*Carthamus Tinctorius* L.) which is called 'Gartoon,' and which was cultivated extensively in Egypt for its oil, used in burning. This explanation is ingenious but has no support."

APPENDIX C: SUDAN, POLITICAL BACKGROUND

The politics of Sudan takes place in the framework of an authoritarian republic in which all effective political power is in the hands of President Omar Hassan al-Bashir. Bashir and his party have controlled the government since he led the military coup on 30 June 1989.

From 1983 to 1997, the country was divided into five regions in the north and three in the south, each headed by a military governor. After the April 6, 1985 military coup, regional assemblies were suspended. The RCC was abolished in 1993, and the ruling National Islamic Front changed its name to the National Congress Party. After 1997, the structure of regional administration was replaced by the creation of twenty-six states. The executives, cabinets, and senior-level state officials are appointed by the president, and their limited budgets are determined by and dispensed from Khartoum. The states, as a result, remain economically dependent upon the central government. Khartoum state, comprising the capital and outlying districts, is administered by a governor.

In December 1999, a power struggle climaxed between President al-Bashir and then-speaker of parliament Hassan al-Turabi, who was the NIF founder and an Islamist ideologue. Al-Turabi was stripped of his posts in the ruling party and the government, parliament was disbanded, the constitution was suspended, and a state of national emergency was declared by presidential decree. Parliament resumed in February 2001 after the December 2000 presidential and parliamentary elections, but the national emergency laws remain in effect. Al-Turabi was arrested in February 2001, and charged with being a threat to national security and the constitutional order for signing a memorandum of understanding with the Sudan People's Liberation Army (SPLA). Since then his outspoken style has had him in prison or under house-arrest, his most recent stint beginning in March of 2004 and ending in June of 2005. During that time he was under house-arrest for his role in a failed coup attempt in September of 2003, an allegation he has denied. According to some reports, the president had no choice but to release him, given that a coalition of National Democratic Union (NDA) members headquartered in both Cairo and Eritrea, composed of the political parties known as the SPLM/A, Umma Party, Mirghani Party, and Turabi's own National

People's Congress, were calling for his release at a time when an interim government was preparing to take over in accordance with the Naivasha Agreement and the Machakos Accord. The Naivasha Agreement signed in January 2005 between the Government of Sudan and SPLA gave autonomy to Southern Sudan and led to the creation of the Government of Southern Sudan.

History:

From 1983 to 1997, the Sudan was divided into five regions in the north and three in the south, each headed by a military governor. After the 1985 coup, regional assemblies were suspended. The RCC was abolished in 1996, and the ruling National Islamic Front changed its name to the National Congress Party. The executives, cabinets, and senior-level state officials are appointed by the president and their limited budgets are determined by and dispensed from Khartoum. The states, as a result, remain economically dependent upon the central government. Khartoum state, comprising the capital and outlying districts, is administered by a governor.

In December 1999, a power struggle climaxed between president Omar al-Bashir and NIF founder, Islamist ideologue, and then speaker of parliament Hassan al-Turabi. Al-Turabi was stripped of his posts in the ruling party and the government, parliament was disbanded, the constitution was suspended, and a state of national emergency was declared by presidential decree. Parliament resumed in February 2001 after the December 2000 presidential and parliamentary elections, but the national emergency laws remain in effect. Around the same time the Black Book, a manuscript by dissident Westerners detailing the domination of the northern peoples, was published. Al-Turabi was arrested in February 2001, and charged with being a threat to national security and the constitutional order for signing a memorandum of understanding with the Sudan People's Liberation Army. He was placed in a maximum-security prison and was freed in 2005.

As part of the agreement ending the Second Sudanese Civil War, nine members of the SPLA and 16 members of the government were sworn in as Ministers on 22 September 2005, forming the first post war government of national unity. The inauguration was delayed over arguments over who would get various portfolios and as a result of the death of vice president John Garang. The National Congress Party kept control of the key energy, defense, interior and finance posts, while an SPLM

appointee became foreign minister. Vice President Salva Kiir was reported to have backed down in the argument over who would have control of the vital Ministry of Energy and Mining, which handles the output of Sudan's oil fields.

Executive branch:

Main office holders

Table 5: Executive branch of Sudan Government

Office	Name	Party	Since
President	Omar Hassan A. al Bashir	National Congress	October 16, 1993
1 st Vice President	Salva Kiir Mayardit	SPLM	August 11, 2005)
2 nd Vice President	Ali Osman Taha	National Congress	July 2005

President al-Bashir's government is dominated by members of Sudan's National Islamic Front (NIF), a fundamentalist political organization formed from the Muslim Brotherhood in 1986; in 1998, the NIF created the National Congress as its legal front; the National Congress/NIF dominates much of Khartoum's overall domestic and foreign policies; President al-Bashir named a new cabinet on April 20, 1996 which includes members of the National Islamic Front, serving and retired military officers, and civilian technocrats; on March 8, 1998, he reshuffled the cabinet and brought in several former rebel and opposition members as ministers; he reshuffled his cabinet again on January 24, 2000 but announced few changes. A government of national unity was sworn in on 22 September, with 16 members from the National Congress, nine from the SPLM and two from the northern opposition National Democratic Alliance, which left the seats vacant in protest over how the posts were allocated. The Darfuri rebels were not represented. Al-Bashir, as chairman of the Revolutionary Command Council for National Salvation (RCC), assumed power on June 30, 1989 and served concurrently as chief of state, chairman of the RCC, prime minister, and minister of defense until 16 October 1993 when he was appointed president by the RCC; upon its dissolution on 16 October 1993, the RCC's executive and legislative powers were devolved to the president and the Transitional National Assembly (TNA), Sudan's appointed legislative body, which has since been replaced

by the National Assembly elected in March 1996; on December 12, 1999 Bashir dismissed the National Assembly during an internal power struggle between the president and speaker of the Parliament Hassan al-Turabi

Legislative branch:

The country is currently in an interim (transitional) period following the signing of a Comprehensive Peace Agreement (CPA) on 9 January 2005 that officially ended the civil war between the Sudanese Government (based in Khartoum) and the southern-based Sudan People's Liberation Movement (SPLM) rebel group. The newly formed National Legislature, whose members were chosen in mid-2005, has two chambers. The National Assembly (Majlis Watani) consists of 450 appointed members who represent the government, former rebels, and other opposition political parties. The Council of States (Majlis Welayat) has 50 members who are indirectly elected by state legislatures. All members of the National Legislature serve six-year terms.

Political Parties in Sudan:

Sudan is a one party dominant state with the National Congress in power. Opposition political parties are allowed, but are widely considered to have no chance of gaining influence.

The main parties:

- ☞ Democratic Unionist Party
- ☞ Liberal Democrats (Hizb AL-Demokhrateen AL-Ahrar)
- ☞ National Congress (Sudan: Al Muttamar al Watani)
- ☞ National Democratic Alliance
- ☞ National Islamic Front
- ☞ Sudan People's Liberation Movement (Sudan People's Liberation Movement/Al-Harakat Al-Shaabia Le Tahreer Al-Sudan)
- ☞ Sudanese Ba'ath Party (formerly pro-Iraqi Command)
- ☞ Sudanese Communist Party
- ☞ Umma Party (Hizb al-Umma)

APPENDIX D: SUDAN, MAP AND FLAG

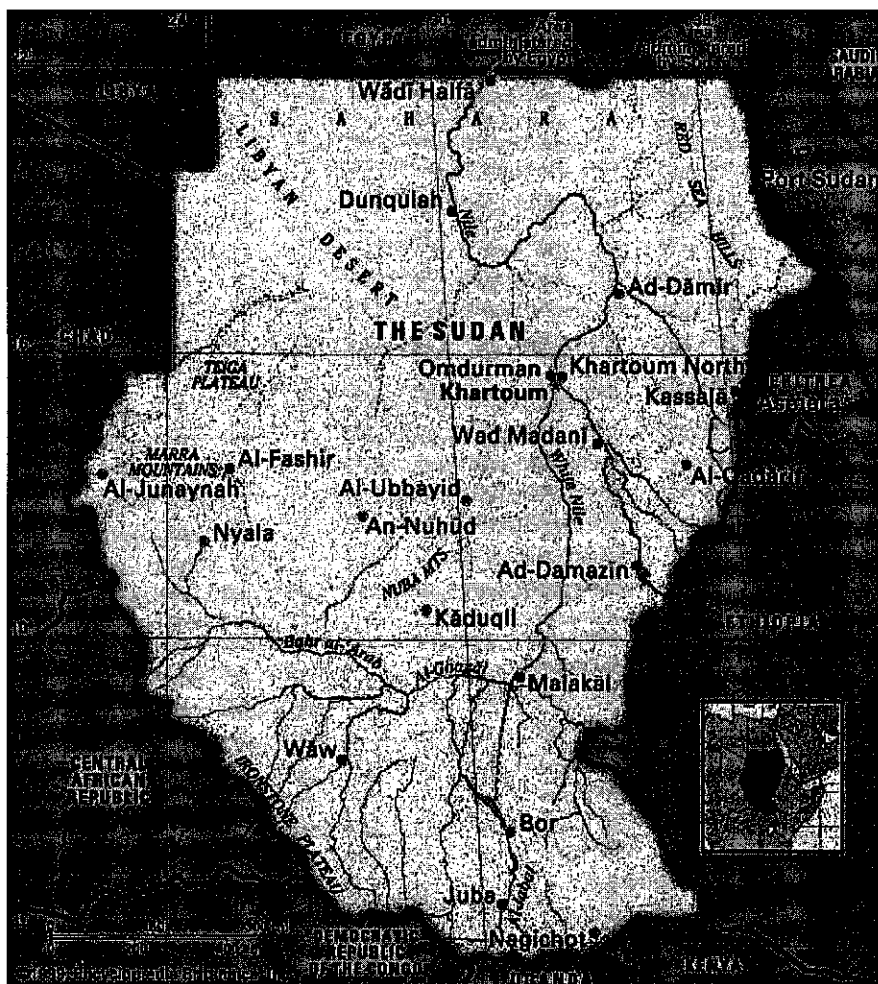


Figure 11: Sudan Political Map



Figure 12: Sudanese Flag

APPENDIX E: BIOGRAPHIES OF CANDIDATES

From Wikipedia, the free encyclopedia and BENT business Network

Omer Hassan Ahmed al-Bashir Biography

Field Marshal Omar Hasan Ahmad al-Bashir (born January 1, 1944) is a Sudanese military leader and current president of Sudan.

Background:

Al-Bashir was born in the small village of Hoshe Bannaga in Sudan, where he received his primary education. His family later moved to Khartoum, where he completed his secondary education. Al-Bashir joined the Sudanese Army at a young age and studied at a military academy in Cairo. He quickly rose through the ranks and became a paratrooper. Later, al-Bashir served with the Egyptian Army when it went to war with Israel in 1973. He is a native speaker of the Arabic language.

Military career

When he returned to the Sudan, al-Bashir was put in charge of military operations against the Sudan People's Liberation Army in the southern half of the country. Becoming a general by the 1980s, al-Bashir took command of a military coup in 1989 that overthrew democratically elected Prime Minister Sadeq al-Mahdi. Al-Bashir immediately banned all political parties, repressed the press, and dissolved Parliament upon assuming control of the nation. He then became Chairman of the Revolutionary Command Council for National Salvation (a newly established body with legislative and executive powers over the country), and assumed the posts of chief of state, prime minister, chief of the armed forces, and minister of defense.

Governance:

Al-Bashir subsequently allied himself with Hassan al-Turabi, leader of the National Islamic Front, and began a program to make northern Sudan an Islamic state. Al-Bashir implemented Sharia and a new Criminal Act over northern Sudan in 1991, enforced by Muslim judges and a newly created Public Order Police. On October 16,

1993, al-Bashir's powers increased when he was appointed president of the country, after which time the Revolutionary Command Council for National Salvation was dissolved. The executive and legislative powers of the council were subsequently given to al-Bashir. He was later elected president (with a five year term) in the 1996 national election. In 1998, al-Bashir and the Presidential Committee put into effect a new constitution. In 1999, al-Bashir and the Parliament made a law which allowed limited political associations in opposition to al-Bashir and his supporters to be formed, although these groups failed to gain any significant access to governmental power. On December 12, 1999, al-Bashir brought troops and tanks against parliament and ousted Hassan al-Turabi, the speaker of parliament, in a palace coup. [Source: Stefano Bellucci, "Islam and Democracy: The 1999 Palace Coup," Middle East Policy 7, no. 3 (June 2000):168].

International arena:

According to the government of Sudan, al-Bashir had offered the United States the arrest and extradition of Osama bin Laden and detailed intelligence data earlier that year and that the Clinton administration was not receptive to the idea, though United States officials deny that any such offer was ever made.[citation needed] In 1998, the U.S. bombed al-Shifa pharmaceutical factory, a factory in Sudan that was allegedly producing chemical weapons for bin Laden, but many doubt if the factory was making such devices at the time of the attack, since the U.S. has failed to provide any evidence or to allow an independent committee to verify these claims.[citation needed] Sudan was subsequently one of the seven nations put on the U.S. State Department's list of countries that sponsor international terrorism, but al-Bashir has fiercely denied that Sudan aids or has any connections with terrorist groups.[citation needed] Al-Bashir subsequently spoke out against the September 11, 2001 terrorist attacks and pressured Saddam Hussein to let weapons inspectors back into Iraq in 2002.[citation needed] Despite al-Bashir's efforts, Sudan still remains carefully monitored in regard to terrorist activity within its borders. As recently as April 2004, U.S. President George W. Bush has called for al-Bashir to step up his efforts in combating terrorism.

Dr. Hassan al Turabi Biography:

His full name is Dr. Hassan 'Abd Allah al-Turabi. An Islamic religious and Islamist political leader in Sudan who may have been instrumental in institutionalizing sharia in the northern part of the country

He has been called a "longtime hard-line ideological leader."

Turabi was leader of the National Islamic Front, a politically powerful but not electorally popular political movement in Sudan. In 1979 he became Minister of Justice. In June 1989, a coup d'etat by allies, the "National Salvation Revolution", brought him and the National Islamic Front to power.

He became a leader of the Sudanese Muslim Brotherhood in the early 1960s. When Gen. Jafa'ar Nimeiri took power in a coup in 1969, Turabi's Islamist party was dissolved and its members arrested, only to return to political life in 1977 in reconciliation with Nimeiri, whose attorney general Turabi became. Nimeiri made shari'a the law of the land in Sudan in September 1983, but shari'a amputations and hangings contributed to a popular nonviolent overthrow of Nimeiri in 1985, and the reinstatement of parliamentary rule. In the 1986 elections, Turabi led a new faction of the Muslim Brotherhood, the National Islamic Front (NIF), to third place in the national assembly.

The NIF sought to create an Islamic state in Sudan. In 1989, from behind the scenes, this party participated in a military coup overthrowing the elected government. From that time until 2001, Turabi was the power behind the throne, whether as leader of the NIF or later as speaker of the assembly. He led the creation of the NIF police state and associated NIF militias to consolidate Islamist power and prevent a popular uprising. The NIF police state and militias committed many human rights abuses, including summary executions, torture, ill treatment, arbitrary detentions, denial of freedoms of speech, assembly, and religion, and violations of the rules of war, particularly in the south, where a civil war was being waged from 1983 to the present. In 1990-91 Turabi also established a regional umbrella for political Islamist militants, the Popular Arab Islamic conference (PAIC), headquartered in Khartoum. It was formed with the immediate aim of opposing American involvement in the Gulf War. Turabi became its secretary general. Under his guidance, the Sudan government created an open-door policy for Arabs, including Turabi's Islamist associate Osama

bin Laden, who made his base in Sudan in 1990-1996. The efforts of the NIF to refashion Sudan into an Islamic state bore mixed results because of the opposition it inspired and the civil war. The Government of Sudan ceased hosting PAIC in 2000.

Early Life:

Turabi was born in the province of Kassala, in eastern Sudan near the border with Eritrea, around 1932. His father was a judge and expert on sharia. Sadiq al-Mahdi, former Prime Minister of Sudan, is his brother-in-law

Education:

As a youth Turabi received an Islamic education, and went on to earn graduate-level degrees at universities in Sudan and abroad:

- ☞ B.A. in Law, Khartoum University
- ☞ M.A Law, University of London 1955-1957
- ☞ Ph.D. in Law, Sorbonne, Paris 1959-1964

Religious and Political believes:

Turabi has espoused progressive Islamist ideas, such as the embrace of democracy, healing the breach between the Sunni and the Shia, integrating `art, music, singing` into religion, and expanding the rights of women, where he noted:

The Prophet himself used to visit women, not men, for counseling and advice. They could lead prayer. Even in his battles, they are there! In the election between Othman and Ali to determine who will be the successor to the Prophet, they voted!

In another interview he said, "I want women to work and become part of public life" because "the home doesn't require much work anymore, what with all the appliances." During an interview on Al-Arabiya TV in 2006, Al-Turabi describes the requirement of hijab as applying only to the Prophet's wives, saying hijab was "a curtain in the Prophet's room. Naturally, it was impossible for the Prophet's wife to sit there when people entered the room." He opposed death penalty for apostasy from Islam and opposed Ayatollah Khomeini's death sentence fatwa against Salman Rushdie. He declared Islamist organizations "too focused on narrow historical

debates and behavioral issues of what should be forbidden, at the expense of economic and societal development and eliminating Muslim backwardness.

Al-Turabi also laid out his vision for a Sharia law that would be applied gradually instead of forcefully, and would only apply to Muslims, who would share power with the Christians in a federal system.

However Turabai once in power in a military coup d'état that overthrew a democratic government, Turabi's rule was known for harsh human rights violations rather than progressive or liberal theology

Political Career

After graduating, he returned to Sudan and became a member of the Islamic Charter Front, an offshoot of the Sudanese branch of the Muslim Brotherhood. Within a five year period, the Islamic Charter Front became a large political group that identified Al-Turabi as its Secretary general in 1964. Through the Islamic Charter Front, Al-Turabi worked with two factions of the Sudanese Islamic movement, Ansar and Khatmiyyah, to draft an Islamic constitution. Members of Ansar define themselves as the followers of Mahdi Muhammad Ahmad, stemming from nineteenth century Sudan. Al-Turabi remained with the Islamic Charter Front until 1969, when Gaafar Nimeiry assumed power in a coup. The members of Islamic Charter Front were arrested, and Turabi spent six years in custody and three in exile in Libya.

In 1977, the regime and the two factions of the Islamic movement in Sudan attempt to reach a "national reconciliation," where opposition leaders were freed and/or allowed back from exile, including Al-Turabi. "Turabi and his people now begin to play a major role, infiltrating the top echelons of the government where their education, frequently acquired in the West, made them indispensable," and "Islamizing society from the top down." Al-Turabi became a leader of the Sudanese Socialist Union, and was promoted to Justice Minister in 1979.

Turabi was imprisoned in the Kobar (Cooper) prison in Khartoum on the orders of his one-time ally, current president Omar al-Bashir in March 2004. He was released on June 28, 2005.

As of 2004 he was reported to have been associated with the JEM (Justice and Equality Movement), an Islamist armed rebel group which is involved in the Darfur conflict. Turabi himself has denied these claims.

Gaafar Nimeiry Biography

Gaafar Muhammad an-Nimeiry (otherwise known as Jaafar Nimeiry, Gaafar Nimeiry or Ga'far Muhammad an-Numayri; born 1 January 1930) was the President of Sudan from 1971 to 1985. He was born in Wad Nubawi Omdurman in central Sudan, and is the son of a postman and the great grandson of a tribal leader from the Wad Nimeiry region in Dongola.

In 1952 Nimeiry graduated from the Sudan Military College, where he was greatly influenced by the ideas of Gamal Abdel Nasser's Free Officers Movement, which gained power in Egypt that same year. In 1966 Nimeiry graduated from the United States Army Command College in Fort Leavenworth, Kansas. Three years later he helped lead a military coup of the civilian government of Ismail al-Azhari, shortly after which he was named Prime Minister of Sudan. He used his position to enact a number of socialist and Pan-Arabist reforms.

Nimeiry successfully weathered a coup attempt by Sadiq al-Mahdi in 1970 and in 1971 was briefly removed from power by a Communist coup, before being restored. Later in 1971 he was elected President, and succeeded in ending the 17-year civil war between north and south Sudan the next year with the Addis Ababa Agreement.

In 1981 Nimeiry, pressured by his Islamic opponents, and still President of Sudan, began a dramatic shift toward Islamist political governance. In 1983 he imposed sharia, or Islamic law, throughout the country - alienating the predominantly Christian and animist south. In violation of the Addis Ababa Agreement he dissolved the southern Sudanese government, thereby prompting a renewal of the civil war. In 1985 Nimeiry authorized the execution of the peaceful political dissident and Islamic reformist Mahmoud Mohamed Taha after Taha -- who was first accused of religious sedition in the 1960s when Sudan's President was Ismail al-Azhari -- was declared an apostate by a Sudanese court. Shortly thereafter on Apr. 6, 1985, Nimeiry was overthrown in a military coup led by Gen. Abdel Rahman Swar al-Dahab and replaced in the following year's elections by the pro-Islamist leader, Sadiq al-Mahdi, who had attempted a coup against him in July 1977.

Nimeiry lived in exile in Egypt from 1985 to 1999, in a villa situated in Heliopolis, Cairo. He returned to Sudan in May 1999 to a rapturous and populous welcome that surprised many of his detractors. Today he is affiliated to the National Congress Party.

Time Line:

1930 January 1: Born in Wad Nubawi, Omdurman, as the son of a postman.

1952: Graduates from the Sudan Military College, and joins the Khartoum garrison.

1960: Joins a group of military officers working according to pan-Arab, socialist ideas and influenced by the Free Officers Movement that was led by Gamal Abdul Nasser in Egypt.

1966: Graduates from the US Army Command College in Fort Leavenworth, Kansas.

1969: Together with four other officers he overthrows the government, and becomes prime minister and chairman of the Revolutionary Command Council (RCC). He starts a campaign aiming at reforming Sudan's economy through nationalization of banks and industries as well as some land reforms.

1970-1978: A number of bilateral investment treaties are signed between Sudan and several states: Netherlands Aug. 22, 1970, Switzerland Feb. 17, 1974, Egypt May 28, 1977, France July 31, 1978

1971 July: Nimeiry is overthrown by a Communist coup, but soon returns to power.

September: Nimeiri wins a referendum with 98.6% of the votes. He now starts a more Western-friendly policy, where banks were returned to private ownership and foreign investment was encouraged as evidenced by a number of bilateral investment treaties that are signed.

1972: With the Addis Ababa Agreement, autonomy is granted to the non-Muslim southern region of Sudan, which brought peace and stability to the region which had witnessed civil war since 1955, before Sudan's independence.

1974-1984: Oil and gas exploration begins in earnest in the country. Chevron Corporation is awarded concessions in the southern and middle parts of the Red Sea and carries out aero-magnetic and gravity surveys. Dry gas and condensate is discovered in two wells.

1975 September: a military coup led by Brigadier Hassan Hussein Osman, failed to remove Nimeiry from power. General Elbagir, Nimeiry's deputy, led a counter coup that brought Nimeiry back within few hours. Brigadier Osman was wounded and later tried in a court Marshall and executed.

1977 July: A bloody, armed, cross-border attempt to overthrow him by Sadiq al Mahdi from Libya is put down.

1976: Chevron discovers the Suakin gas field.

1979: Chevron makes its first oil discovery in Abu Jabra #1, west of Muglad, where an 8 million barrels (1,300,000 m³) reserve and a 1,000 barrels per day (160 m³/d) (b/d) production rate are estimated.

1982, Chevron drills 22 discovery, appraisal and production wells. Chevron estimated a total oil reserve of 593 million barrels (94,300,000 m³) and a production rate of 3,600 bbl/d (570 m³/d).

1978 18 July - 12 July 1979: Nimeiry elected Chairman of the Organization of African Unity.

1981: Nimeiry allies with the Muslim Brotherhood.

1983: Nimeiry imposes Islamic law, Sharia, for all of Sudan. The administrative boundaries of the south are also reformed. In the south, the civil war restarts.

1985 April 6: While Nimeiry is on an official visit to the United States of America, a bloodless military coup led by his defense minister ousts him from power.

1985-1999: Nimeiry lives in Egypt.

1999 May 22: Returns to Sudan from exile.

2005 March 2: Nimeiry's party The Alliance of the Peoples' Working Forces merges with the ruling National Congress Party of Sudan. The National Congress Party negotiated an end to Sudan's civil war that was signed in a Comprehensive Peace Agreement on January 9th 2005.