A Designation-Based Meeting Scheduling System for the Academic Staff Union of Nigerian Universities, University of Uyo Branch

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Abstract

Available statistics proves that most meetings scheduled without prior agreement among the involved members of an organisation suffer low turnouts. Moreover, highly ranked members and members with certain responsibilities in the organisation are known to have tighter schedules and should hence be given some considerations while scheduling meetings. The work entailed in this paper is the design, implementation and analysis of a Designation-Based Meeting Scheduling System (DBMSS) tailored to address low turnouts in meetings held by the Academic Staff Union of Nigerian Universities, University of Uyo branch (ASUU-UUB). DBMSS is a web-based system that provides a platform where meeting proposals and agenda are published by the executive of ASUU-UUB for timely and easy visualization by members of the organisation at remote locations. Besides, the system provides a mechanism that will enable the members to vote their favourable days and times for each meeting. The votes captured by the system are automatically assigned numerical values and are aggregated to realize the day and time that will yield the best turnouts. Furthermore, each member is assigned a weight based on his/her academic rank and appointment(s) in the university. The designation weights of these members affect their vote scores. A working prototype of the system was achieved using a MySQL Database Management System (DBMS) for the data storage, PHP programming language for the system logic and control of information flow, HyperText Markup Language (HTML) and Cascaded Style Sheets (CSS) for the Graphic User Interface (GUI) design. This system will help ASUU-UUB in ensuring active participation in its meetings.

Keywords: Meetings, Scheduling system, Database, Aggregation algorithm, ergonomics, prototype, Rank, Appointment

1. INTRODUCTION

Arbitrary selection of meeting days and times by the executive of any organisation among other factors is a major cause of low turnouts in meetings. To ensure active participation of members in meetings, organisations must provide a platform where the opinions of the members are sought and sampled to guide the organisation executive in making optimal decisions in selecting the best day and time, in order to improve the turnouts of the members. In ASUU-UUB, meetings are fixed arbitrarily by the executives, thus, resulting in low turnouts especially among the highly placed members of the organisation such as Professors, Senior Lecturers, Heads of Departments, Deans of faculties, etc. These members have tighter schedules and may not readily adjust their programmes for these meetings. Hence, their ideas and opinions are missed.

[1] proposed that with the advance of Web Service technologies and the emergence of Web Services into the information space, tremendous opportunities for empowering users and organizations appear in various application domains including electronic commerce, travel, intelligence information gathering and analysis, health care, digital government, etc." The rapid proliferation of the Internet and the cost-effective growth of its key enabling technologies are revolutionizing information technology and creating unprecedented opportunities for developing large scale distributed applications [2]. The extent of web-based application has grown extensively and has moved to become a platform that can support all facets of organizational work [3]. Inspired by the above observations, this work seeks to analyse, design and implement a web-based system that serves as a dedicated platform where ASUU-UUB members can access meetings proposals, as well as the agenda to be discussed in the meeting and also vote their favourable days and times which are aggregated by the system to realize the best time and day for the meetings. The vote cast by the members are assigned numerical values based on their ranks and appointments, in order to give higher considerations to members who are more engaged due to their academic or administrative positions. Thus, the consents of ASUU members are sought for by the executives of ASUU-UUB before scheduling meetings, thereby addressing the issue of low turnouts among members of higher cadre whose wealth of experience would have been of immense benefits in the meetings.

2. SYSTEM ARCHITECTURE

The DBMSS is a web-based application that follows the concept of the 3-tier web architecture, which is a client-server architectural format consisting of the presentation tier (user interface), program logic tier (server-side scripting) and the computer data storage (database). The 3-tier web architecture shown in Fig.1 outlines clearly the linkage between its layers or components – presentation tier, program logic tier and data storage tier. It also shows the direction of dataflow from one layer to the other.

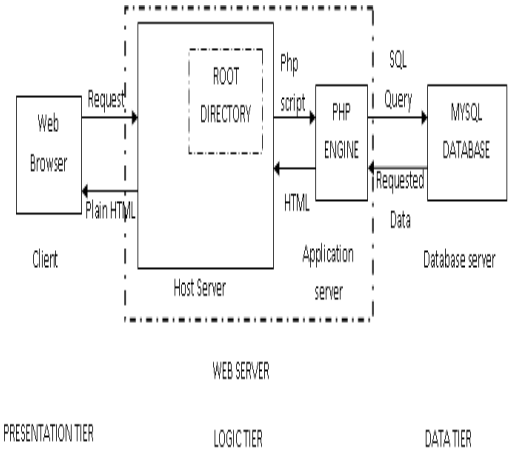


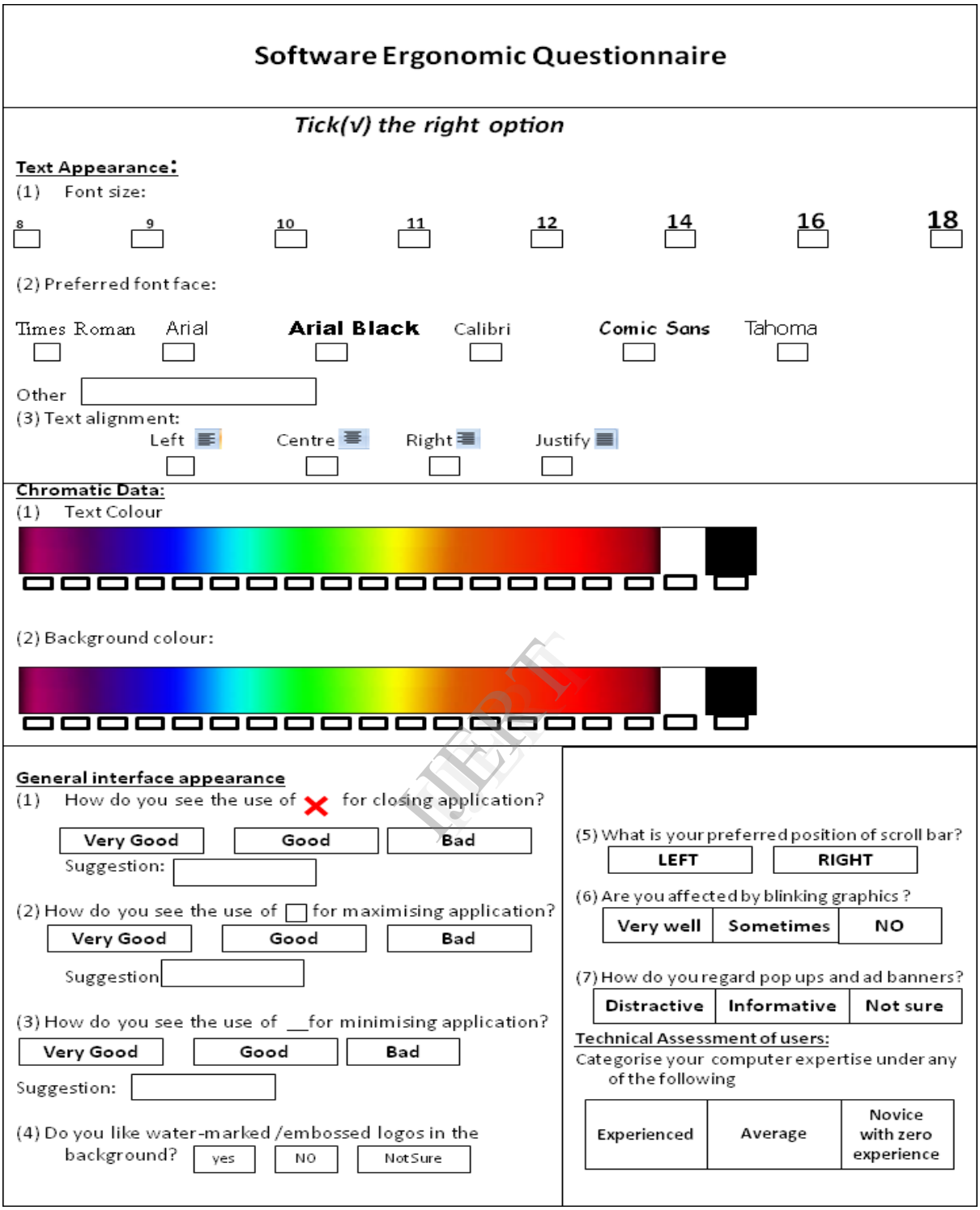
FIG. 1: The 3-tier web architecture of the DBMSS

The presentation tier is the topmost layer. It is the Graphical User Interface (GUI) which provides interaction between the users and the application. In this work, the HyperText Markup Language (HTML) and Cascaded Style Sheets are used in creating the presentation layer. The main function of the logic tier is to receive HTML requests sent from the web browser, interpret and process the request/data; move the data into data storage; retrieve the requested information (data) from the computer data storage and transform it into web browser understandable format (HTML). In the design of this system, PHP will be used in the logic tier. The Data tier manages and controls how data and information are stored and retrieved from the database. In this project, MySQL will be used for the data storage.
etc.

3. METHODOLOGY

This system is a software intensive system, as such, its development follows a software development methodology phased into the following stages: Software Requirement Engineering (SRE), Software Ergonomics Engineering (SEE), System Modeling, Requirement Implementation and Testing.

To ensure that the system meets the set objectives and goals, a set of activities were adopted in order to facilitate the understanding and analyses of the system and user requirements. These activities constitute the Software Requirement Engineering (SRE) process. The tools adopted for this purpose are the use of questionnaire, interviews with the stakeholders and Rapid Assessment Process (RAP) team discussion. The elicited requirements were negotiated and prioritized for implementation. Software Ergonomics Engineering(SEE) approach proposed by [4] was adopted in ensuring that those human factors that may affect the system's usability, "comfortability", "learnability", efficiency as well as the users health are well addressed. SEE begins with the issuance of a Software Ergonomic Questionnaire (SEQ) for the purpose of gathering the necessary ergonomic data from the users [4]. A model of a SEQ is presented in Fig. 2. The conceptual framework of the system and brief descriptions of the system functionalities are presented in the subsequent section.



Software Ergonomic Questionnaire

Tick(√) the right option

Text Appearance:

(1) Font size:

8 ☐ 9 ☐ 10 ☐ 11 ☐ 12 ☐ 14 ☐ 16 ☐ 18 ☐

(2) Preferred font face:

Times Roman ☐ Arial ☐ **Arial Black** ☐ Calibri ☐ *Comic Sans* ☐ Tahoma ☐

Other ☐

(3) Text alignment:

Left ☐ Centre ☐ Right ☐ Justify ☐

Chromatic Data:

(1) Text Colour

(2) Background colour:

General interface appearance

(1) How do you see the use of ✕ for closing application?

Very Good | Good | Bad

Suggestion: ☐

(2) How do you see the use of ☐ for maximising application?

Very Good | Good | Bad

Suggestion ☐

(3) How do you see the use of __for minimising application?

Very Good | Good | Bad

Suggestion: ☐

(4) Do you like water-marked /embossed logos in the background? yes ☐ NO ☐ NotSure ☐

(5) What is your preferred position of scroll bar?

LEFT | RIGHT

(6) Are you affected by blinking graphics ?

Very well | Sometimes | NO

(7) How do you regard pop ups and ad banners?

Distractive | Informative | Not sure

Technical Assessment of users:

Categorise your computer expertise under any of the following

Experienced	Average	Novice with zero experience

Fig. 2: A model of a SEQ. Source: Ezenkwu et al (2013)

3.1 CONCEPTUAL FRAMEWORK AND BRIEF DESCRIPTIONS OF THE SYSTEM MODULES

The system allows only registered users who have their user authentication details to log into the system. New members are prompted to register before receiving authorization. When logged in, users can access and make use of the system functionalities. A flowchart depicting user's verification procedure is presented in Fig. 3. Furthermore, registration procedure is shown in the flowchart of Fig. 4, while the functional decomposition of the system is shown in Fig. 5. The functionalities are briefly explained in Table 1.

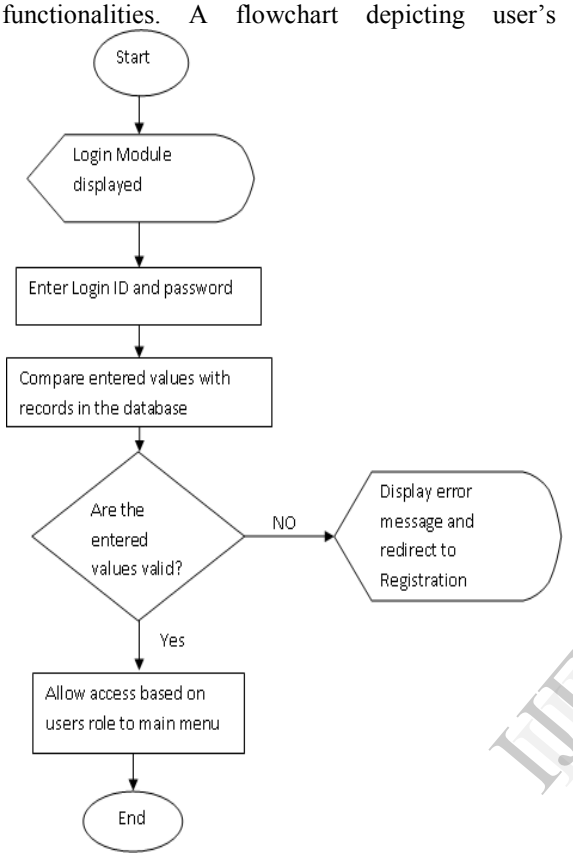


Fig. 3: Flowchart showing user verification procedure

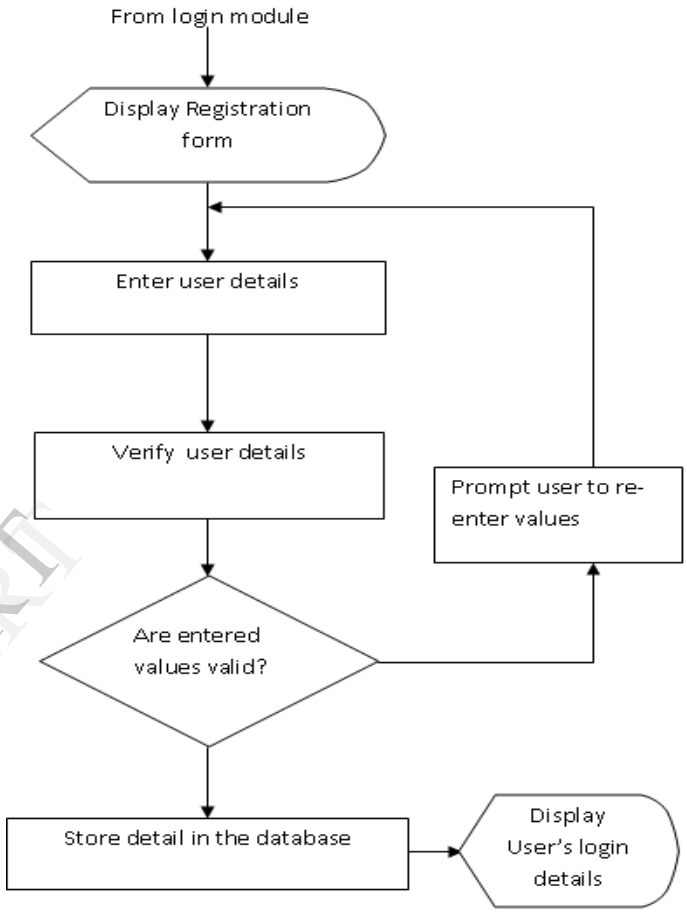


Fig. 4: Flowchart showing user registration procedure

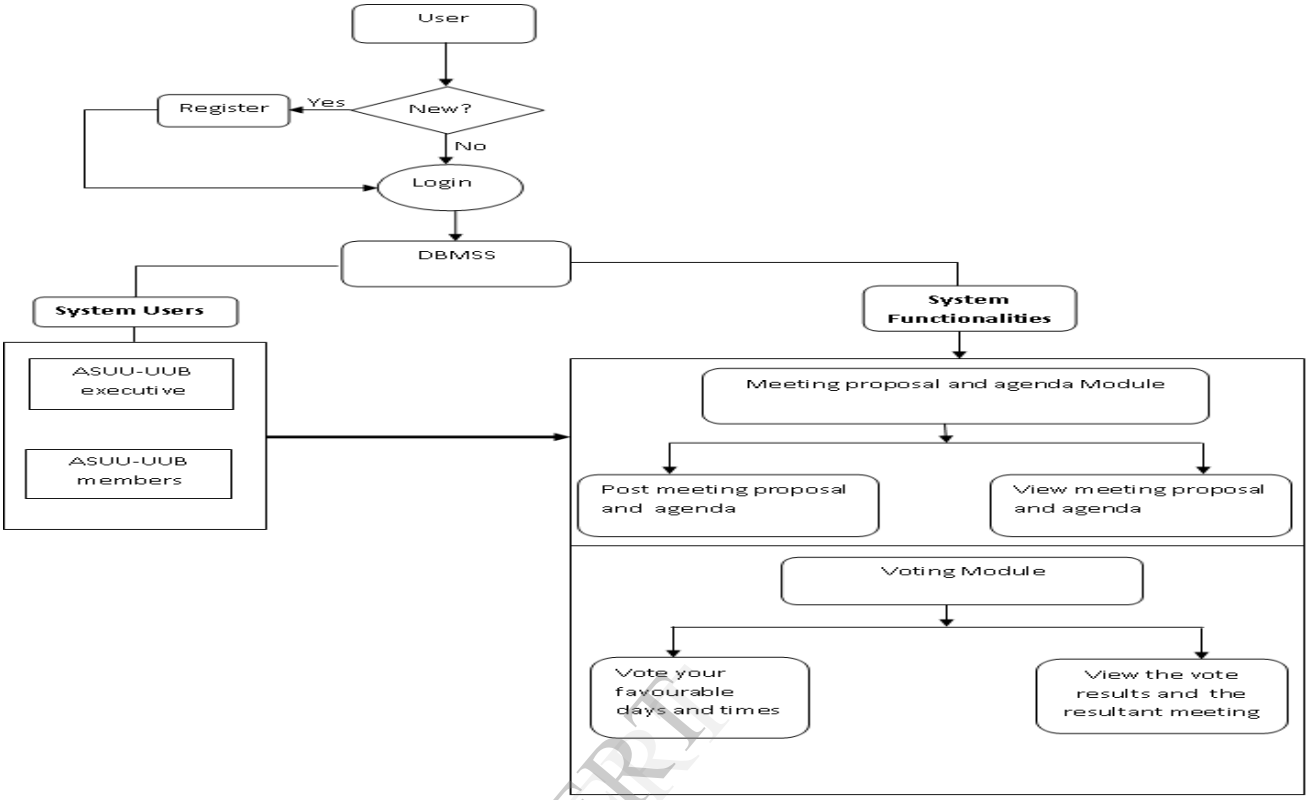


Fig. 5: The conceptual framework of the system

Table 1: Descriptions of the System functionalities

S/N	SYSTEM MODULE	DESCRIPTION
1.	**Meeting Proposal and Agenda Module**	This module has two sub-functions: i. *Post meeting proposal and agenda*: This functionality is accessible only to the ASUU-UUB executive. The module presents a platform where the ASUU-UUB executive's decisions to hold meetings are made known to the congress members. The information presented through this platform include the supposed period of the meeting such as the week and the month, the agenda, how urgent the meeting is as well as the deadline for the votes. ii. *View meeting proposal and agenda:* Members of the association are given access to the information posted by the ASUU-UUB executive through this module.
2.	**Voting Module**	This module has two sub-functions as well: i. *Vote your favourable days*

		and times: The members of the congress can vote their favourable days and times for the meetings. The votes are categorized as follows: • UP • DOWN • NEUTRAL UP vote means that the time and day are very favourable. DOWN vote means that the day and time are not favourable, while NEUTRAL vote implies that that day and time is somewhat favourable. The system automatically assigns numerical values to the votes. The votes are aggregated to give the resultant vote for each day selected and the corresponding time using the formulae presented in equation (1). The ranks of the members are considered in the calculation to give higher preference to the members in the higher cadre. ii. *View the result and the resultant meeting schedule:* After the deadline, the system will automatically generate the results of the votes and select the date and time with the greatest votes as the day of the meetings. The information is made available and accessible to all the congress members.

3.2 USE CASE DESCRIPTION OF THE SYSTEM

ACTORS: ASUU-UUB executive, ASUU-UUB members.

PRE-CONDITION: A user (actor) must register in the system and must have valid login details in order to access the system functionalities.

POST-CONDITION: The executive of ASUU-UUB can post meeting proposals, the agenda to be discussed, the urgency of the meeting and the deadline for the members' votes. The ASUU-UUB members can visualize the meeting proposal and vote their favourable days and times, which are aggregated by the system to give the best meeting schedules for optimal turnouts.

BASIC FLOWS:

1. Upon successful login by the actor, the homepage is displayed and the actor can interact with the system functionalities.
2. Based on the level of privilege, an actor can perform the following tasks

i. Post meeting proposal and agenda
ii. View meeting proposal and agenda
iii. Vote favourable days and times for the meetings
iv. Display the resultant meeting's day and time
v. View the resultant day and time for the meeting

The Use case diagram is presented in Fig. 6.

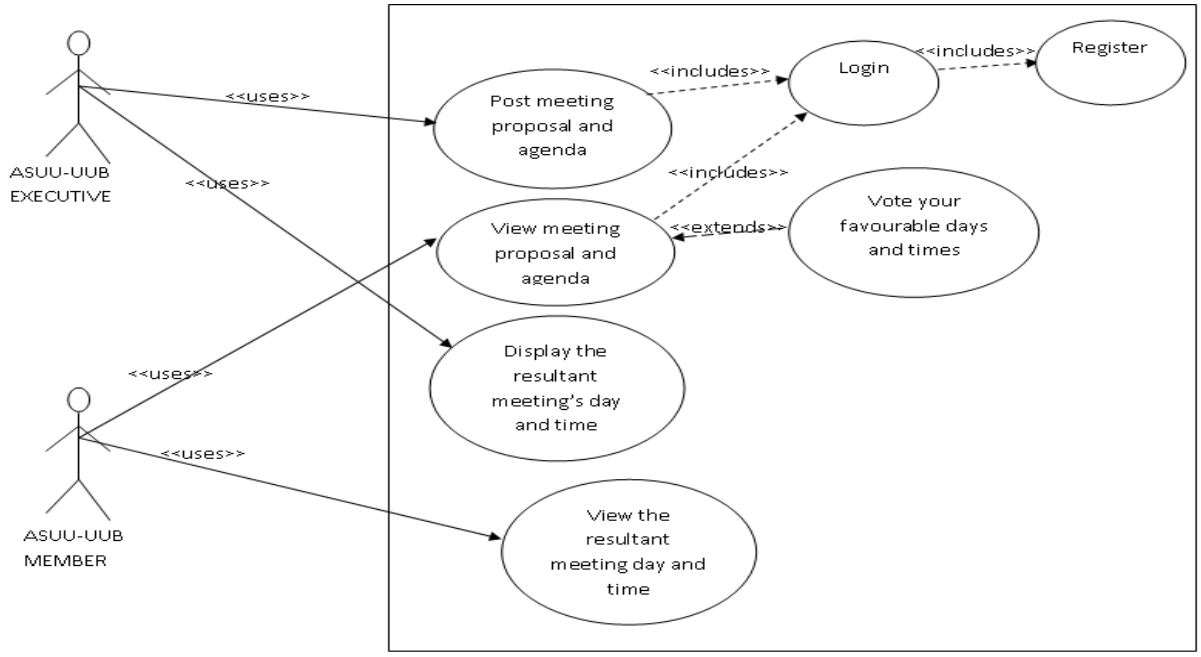
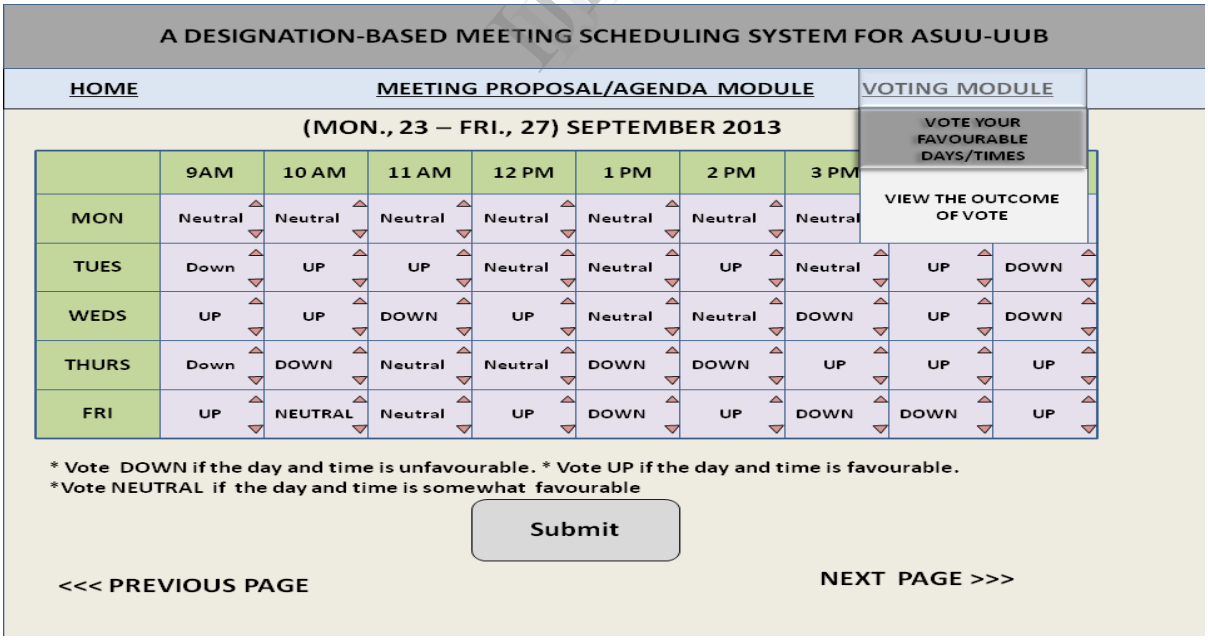


Fig.6: Use case Diagram for the system

3.3 VOTE COLLECTION INTERFACE

The interface for collecting ASUU_UUB members' votes is presented in Fig.7. Days are arranged in rows while times are arranged in columns. Each cell signifies a day and the corresponding time. The default vote for each cell is DOWN. A member is expected to select either UP or NEUTRAL, or allow the default (DOWN). DOWN implies that that day and time are certainly unfavourable, UP means that that day and time are certainly favourable, while NEUTRAL means that that day and time is somewhat favourable.



	9AM	10 AM	11 AM	12 PM	1 PM	2 PM	3 PM		
MON	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral		
TUES	Down	UP	UP	Neutral	Neutral	UP	Neutral	UP	DOWN
WEDS	UP	UP	DOWN	UP	Neutral	Neutral	DOWN	UP	DOWN
THURS	Down	DOWN	Neutral	Neutral	DOWN	DOWN	UP	UP	UP
FRI	UP	NEUTRAL	Neutral	UP	DOWN	UP	DOWN	DOWN	UP

Fig. 7: Vote Collection Interface

3.4 VOTE AGGREGATION ALGORITHM

Table 2 shows the matrix arrangement of the ranks and appointments. Each cell represents the intersection between the appointment (a) and the corresponding academic rank (r).

The total weight assigned to an ASUU-UUB member is given by;

$W = (nr + \sum_{i=1}^{n} a_i)$ (1)

where r is the rank of the member, n is the total number of appointments , a_i is the weight of ith appointment where i = 1,2,3,...., n and W is the weight of the member.

Table 2: Matrix arrangement of the academic ranks and appointments as well as their corresponding weights

		APPOINTMENTs (a)					
		None	Time table officer	Exam officer	Course advisers	HOD	Dean of Faculty
Academic Rank(r)	Weights	0.0	1.0	1.5	2.0	2.5	3.0
Graduate Assistant	1.0	1.0	2.0	N.A	N.A	N.A	N.A
Assistant Lecturer	1.5	1.5	2.5	3.0	N.A	N.A	N.A
Lecturer II	2.0	2.0	3.0	3.5	4.0	N.A	N.A
Lecturer I	2.5	2.5	3.5	4.0	4.5	N.A	N.A
Senior Lecturer	3.0	3.0	4.0	4.5	5.0	5.5	6.0
Associate Professor	3.5	3.5	4.5	5.0	5.5	6.0	6.5
Professor	4.0	4.0	5.0	5.5	6.0	6.5	7.0

The vote of the members is represented as v. The votes are assigned weights as follows:

Vote	Weight
DOWN	0
NEUTRAL	1
UP	2

The new total vote, Q_n for each cell in Fig.5 is given by

$Q_n = Q_{n-1} + (nr + \sum_{i=1}^{n} a_i).v$ (2)

where Q_{n-1} is the initial total vote and a_i , n, r, v retain their previous meanings. Fig. 6 presents a flow chart for the implementation of the voting mechanism. The description of the flowchart is as follows:

(1) Input V: The user selects his/her vote
(2) Submit: The user clicks the submit button
(3) The system scans the database to retrieve the required parameters for computing the user's vote score. The total vote of the selected day and time before the user's vote is equally retrieved from that database in order to compute the new total vote of the selected day and time.
(4) The new total vote is computed using: New total = initial total vote + user's vote score. Where, User's vote score = user weight * vote
(5) The system updates the value of the total vote in the database
(6) The system verifies if it is deadline. If no, the system expects more votes from members
(7) If yes, the vote result and meeting schedule is displayed.

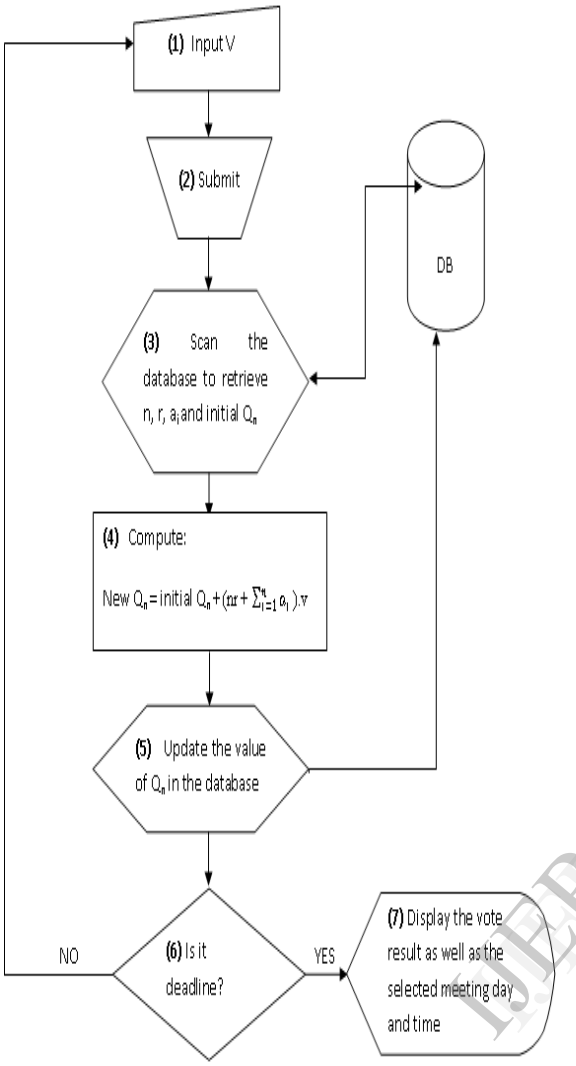


Fig. 8: A flow chart for the implementation of the voting mechanism

4.0 EVALUATION OF THE VOTE AGGREGATION ALGORITHM USING SAMPLE DATA

The vote aggregation algorithm is evaluated using data sampled from ten ASUU-UUB members. The best meeting day and time were selected from five competing days. Each cell of the table represents a day and a corresponding time. The data collected from these members are presented in Table 3.

The notations used in the table are described as follows:

- G.A => Graduate Assistant
- A.L => Assistant Lecturer
- L2 = > Lecturer II
- L1 = > Lecturer I
- S.L => Senior Lecturer
- Ass. Prof = > Associate professor
- Prof = > Professor
- Non = > No appointment
- TTO = > Time Table officer
- EO = > Exam Officer
- CA = > Course Adviser
- HOD = > Head of Department
- DOF = > Dean of faculty
- U => Up vote
- N => Neutral
- Empty cell => down vote (default vote)

Table 3: A Sample of the Collected Data

Members S/N	Rank (r)	Appointment(a)						Days and Time					
		NON	TTO	EO	CA	HOD	DOF	Time / Day	9am	10am	11am	12pm	1pm
#1	G.A	√						Mon	U				
								Tue			N	N	
								Wed				U	
								Thur					N
								Fri		U	U		

#2	Prof						√	Mon					
								Tue	U				
								Wed		N	U	U	U
								Thur					
								Fri			N		N
#3	L1		√	√				Mon					
								Tue	U	U		N	
								Wed					U
								Thur	U	U	U		
								Fri					
#4	Prof	√						Mon	U	U	U	N	N
								Tue					
								Wed	U		N		U
								Thur					
								Fri			U		
#5	S.L				√			Mon					
								Tue	N	N	U		
								Wed		U		N	
								Thur		U			
								Fri	U				
#6	Ass. Prof					√		Mon				N	U
								Tue					U
								Wed		U	N		U
								Thur					
								Fri					
#7	L2			√				Mon					U
								Tue	U		N	U	
								Wed			U	N	
								Tue		N			

								Fri				U	
#8	L2	√						Mon			U		N
								Tue					U
								Wed		U		U	N
								Thur		N	N		
								Fri				N	
#9	A.L	√						Mon			N		U
								Tue	U	N	U		
								Wed			U		U
								Thur			U		N
								Fri					
#10	L1	√						Mon					
								Tue	U	N			U
								Wed				U	
								Thur					N
								Fri		U			U

4.1 AGGREGATION OF VOTE SCORES

The vote scores are aggregated using the vote aggregation algorithm discussed in section 3.4. The votes in table 3 are replaced by the votes scores and the weights of the members to give Table 4.

Table4: Collation of each members vote for each cell

Members S/N	TOTAL WEIGHT OF MEMBER $(nr + \sum_{i=1}^{n} a_i)$	VOTE SCORE PER MEMBER FOR EACH VOTED CELL $(nr + \sum_{i=1}^{n} a_i).V$					
		Time / Day	9am	10am	11am	12pm	1pm
	1.0	Mon	2				

#1		Tue			1	1	
		Wed				2	
		Thur					1
		Fri		2	2		
#2	7.0	Mon					
		Tue	14				
		Wed		7	14	14	14
		Thur					
		Fri			7		7
#3	8.5	Mon					
		Tue	17	17		8.5	
		Wed					17
		Thur	17	17	17		
		Fri					
#4	4.0	Mon	8	8	8	4	4
		Tue					
		Wed	8		4		8
		Thur					
		Fri			8		
#5	5.5	Mon					
		Tue	5.5	5.5	11		
		Wed		11		5.5	
		Thur		11			
		Fri	11				
#6	6.5	Mon				6.5	13
		Tue					13
		Wed		13	6.5		13
		Thur					
		Fri					

#7	3.5	Mon					7
		Tue	7		3.5	7	
		Wed			7	3.5	
		Thur		3.5			
		Fri				7	
#8	2.0	Mon			4		2
		Tue					4
		Wed		4		4	2
		Thur		2	2		
		Fri				2	
#9	1.5	Mon			1.5		3
		Tue	3	1.5	3		
		Wed			3		3
		Thur			3		1.5
		Fri					
#10	2.5	Mon					
		Tue	5	2.5			5
		Wed				5	
		Thur					2.5
		Fri		5			5

4.3 RESULT ANALYSIS

The total vote of each cell is presented in Table 5. This is achieved using equation (2). It has been observed that Wednesday, 1pm has the highest vote score and should be selected as the meeting day and time. Referring to table 3, the favoured members of the union are members #2(Prof and DOF), #3(L1, TTO & EO), #4(Prof), #6(Ass. Prof) and #9(AL). #8(L2) is neutral about the day and time.

Table 5: vote result

Time / Day	9am	10am`	11am	12pm	1pm
Mon	10	8	13.5	10.5	22
Tues	51.5	26.5	18.5	16.5	22
Wed	8	31	34.5	34	57
Thurs	17	33.5	22	0	5
Fri	11	7	17	0	13.5

5.0 CONCLUSION

A Designation-Based Meeting Scheduling System (DBMSS) tailored to address the issue of low turnouts in the meetings held by ASUU-UUB has been presented in this paper. The system provides a platform where ASUU-UUB members can visualize meeting proposals and agenda, as well as a mechanism that will enable them vote their favourable days and times for each meeting. The votes captured by the system are automatically assigned numerical values and are aggregated to realize the day and time that will yield the best turnouts. Furthermore, each member is assigned a weight based on academic rank and appointment(s) in the university. The formulae for aggregating the votes based on these academic ranks and appointments was presented and analysed in this paper.

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