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Performance Evaluation and Analysis of Biometric Workload Attendance Management System

I.R. Idowu & O.D. Adeniji
Department of Computer Science
University of Ibadan
Ibadan, Nigeria
Emails: roseline_12@yahoo.com; Sholaniji@yahoo.com

ABSTRACT

The study examines biometric attendance system as one of the most successful applications of biometric technology. The main advantage of a biometric attendance system is to avoids "buddy-punching". Buddy punching was a major loophole which has being exploiting in the traditional time attendance systems. The evaluation and analysis of workload was investigated to determine the impacts of teacher performance. Findings from this study indicated that there is a significant relationship between the independent variable and each of the two dependent variables. However qualitative data indicate the presence of a problem with workload analysis and primary factor in teachers' choosing to leave the profession early. Positive social change may result if administrators utilize the derived formula for maximizing teacher's performance on students as teacher's well-being when assigning teaching and non-teaching duties to teachers. A biometric attendance management system was developed to verify the workload performance impact on teachers and students.

Keywords: biometric, attendance management system, workload, performance

1. INTRODUCTION

Maintaining the attendance is very important in a discipline institution, for monitoring staff punctuality. Every institute has its own method in this regard. Some are taking attendance manually using the old paper or file based approach and some have adopted methods of automatic attendance using some biometric techniques. That is why keeping the accurate record of attendance is very important. At present attendance is usually noted using paper sheets and the old file system, this approach is being used from a long time. It becomes difficult for the management to regularly update the record and manually calculate the percentage of subject taken. Keeping these issues in mind a system is designed to overcome the problems associated. There are many biometrics that can be utilized for some specific systems but the key structure of a biometric system is always same. Biometric systems are basically used for one of the two objectives identification or verification Identification means to find a match between the query biometric sample and the one that is already been stored in database.

For example to pass through a restricted area you may have to scan your fingerprint through a biometric device. A new template will be generated that will be compared with the previously stored templates in database. If match found, then the person will be allowed to pass through that area. On the other hand verification means the process of checking whether a query biometric sample belongs to the claimed identity or not. The commonly used biometric systems are (i) Iris recognition (ii) Facial recognition (iii) Fingerprint identification (iv) Voice identification (v) DNA identification (vi) Hand geometry recognition (vii) Gait recognition (viii) Signature verification Previously the biometrics techniques were used in many areas such as building security.

2. LITERATURE REVIEW

2.1 Attendance management system

Advances in sensor technology and an increasing demand for biometrics are driving a burgeoning biometric industry to develop new technologies. As commercial incentives increase, many new technologies for person identification are being developed, each with its own strengths and weaknesses and a potential niche market. Alphonse Bertillon developed a method of identifying individuals based on detailed records of their body measurements, physical descriptions and photographs. This method was termed as "Bertillonage" or anthropometrics and the usage was aborted in 1903 when it was discovered that some people share same measurements and physical characteristics (State University of New York at Canton, 2003). The concept of using iris pattern for identification was first proposed by Ophthalmologist Frank Burch in 1936 (Iradian Technologies, 2003). During 1960, the first semi-automatic face recognition system was developed by Woodrow W. Bledsoe, which used the location of eyes, ears, nose and mouth on the photographs for recognition purposes. In the same year, the first model of acoustic speech production was creased by a Swedish Professor, Gunnar Fant. His invention is used in today's speaker recognition system (Woodward et al, 2003). The first commercial hand geometry system was made available in 1974 for physical access control, time and attendance and personal identification. The success of this first biometric automated system motivated several funding agencies like FBI Fund, NIST for the development of scanners and feature extraction technology (Ratha and Bolle, 2004), which will finally lead to the development of a perfect human recognizer.

2.2 Level Features Based Recognition

There is a growing interest in using Level 3 features, such as pores (Stosz and Alyea, 1994; International Biometric Group, 2008), ridge contours (Jain et al., 2007) and, dots and incipient ridges Neh et al 2013, for fingerprint matching. It is claimed that Level 3 features contain discriminating information and can improve the performance of matching rolled/plain to rolled/plain fingerprints. This section reviews works that focus on the extraction of pores and matching performance from high resolution images. skeleton-tracking-based approaches are quite time- consuming and work well only with very high quality fingerprint images. The filtering-based approaches are more efficient and more robust. They use static isotropic pore models to detect pores. The tracking algorithm in the Skeleton Tracking-based Approaches advances one element at a time .. Experiment results published were obtained by using a database of 258 fingerprints taken from 137 individuals by combining minutia and pore information in jawiad et al 2014.

A lower FRR of 6.96 percent (compared to 31 percent for minutiae alone) at a FAR of 0.04 percent was obtained. Selfedene et al 2010 conducted research to find the advantage of level 3 features over level 2 features in fingerprint fragment matching when supplied with high-resolution images. In order to extract pores, first the image is binarised by applying a threshold method. In the binary image, closed pores look like a 'hole' in a ridge. They focus on areas of white pixels entirely surrounded by black pixels. Then the upper and lower thresholds t_{min} and t_{max} were defined.

Each suspected pore whose surface is below t_{min} and above t_{max} is discarded. The object of a surface smaller than t_{min} and larger than t_{max} are removed, because they are noise artifacts or not likely to be pore feature. The next step is to extract open pore look like 'hook' and skeletalise the valleys of binarised image. A hierarchical matching system that utilized level 1, 2 and 3 features from 1000 dpi scanned fingerprint images was proposed by Jain et al. (2007). The level 3 features extracted were pores and ridge contours that were locally matching in windows associated with matched minutiae points using an algorithm called Iterative Closest point (ICP) (Besl and McKay, 1992). The experiments showed that a relative reduction of 20% occurred in EER, while combining level 3 features with level 1 and 2 features. Vishai et al.2013 used a score-level fusion technique and combined level 2 and level 3 match scores to improve fingerprint recognition accuracy. The match scores were obtained using classifiers which were first augmented with a quality score that was determined using redundant discrete wavelet transform of an image as adapted in christain et al 2012 .

3. METHODOLOGY

3.1 System Development of the Attendance Management

The developed system only complements the existing methods and minimizes the challenges and problems recognized with the existing system by proffering solution to them. The solution proffered include: it can track employee performance, enforce Discipline, eliminate paperwork and filing, boost in productivity and easy remote access. The system was designed using Active Server Page.NET with Microsoft Visual Studio 2010 as front end (coding) and backend (file design) Object Linking Embedding Database. The overall programming environment of the biometric fingerprint attendance management system is divided into client and server .

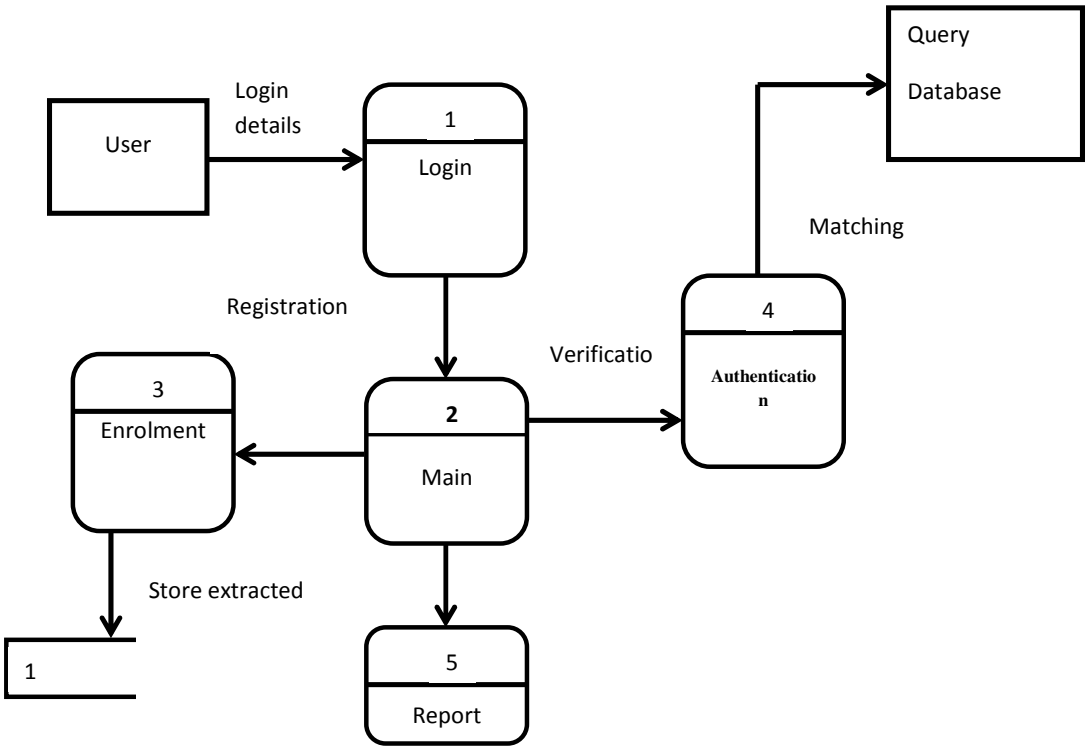

Fig 1: Data Flow Diagram (DFD)

The client side implementation with tools such as Microsoft studio Dotnet that provide support for C# Programming commands and Net beans that support Java programming. The need to process the entries on the form objects warrants the need for a common Gateway interface (CGI) tool such as PHP used in this case.The WAWP1.4.4 administration has the Apache server embedded within the MySQL database server which was used for the implementation of the database. Fig 1 is a data flow diagram (DFD) that provides a general overview of a system; it is also known as level o diagram. Other data flow diagram can be used to focus on the details of a context diagram. The main processes in the context diagram represent the major functions of the system, and these major functions correspond to such actions .

The Front liner's college, Iwo road, Ibadan ,Nigeria was investigated, using two categories of staffs, teaching and non teaching staffs. Enrolment module: this is the registration module where user is registered in other to extract unique features for identification.Authentication: this module is the verification module where user's feature is confirmed.Report: this module gives the record or list of enrolled and confirm staffs in the system. he user input login details into process 1 which is login module, if the login details are valid, the system proceeds to process 2 else it will not allow user to proceed to next process as shown in fig 3..

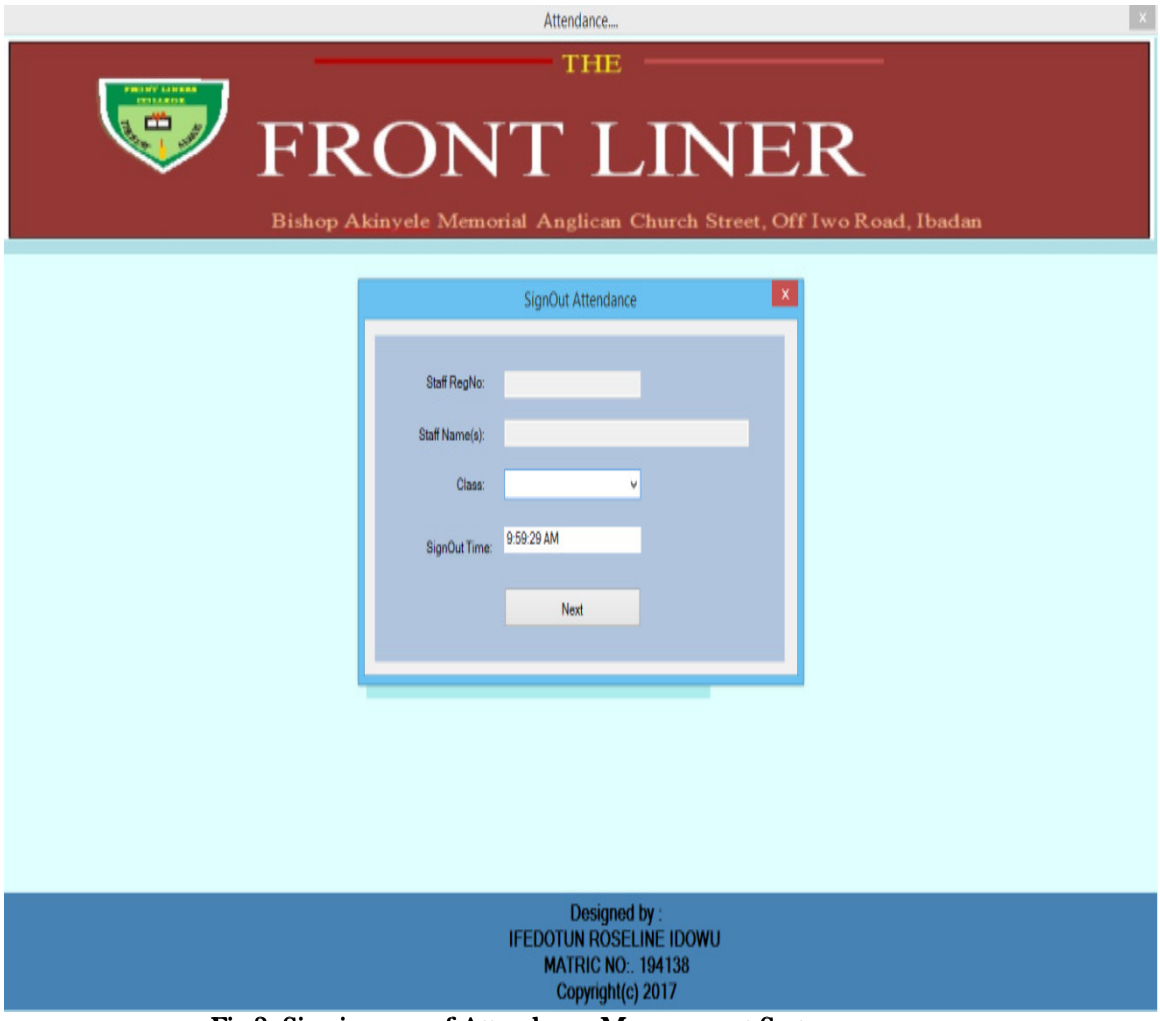

Fig 3: Sign in page of Attendance Management System

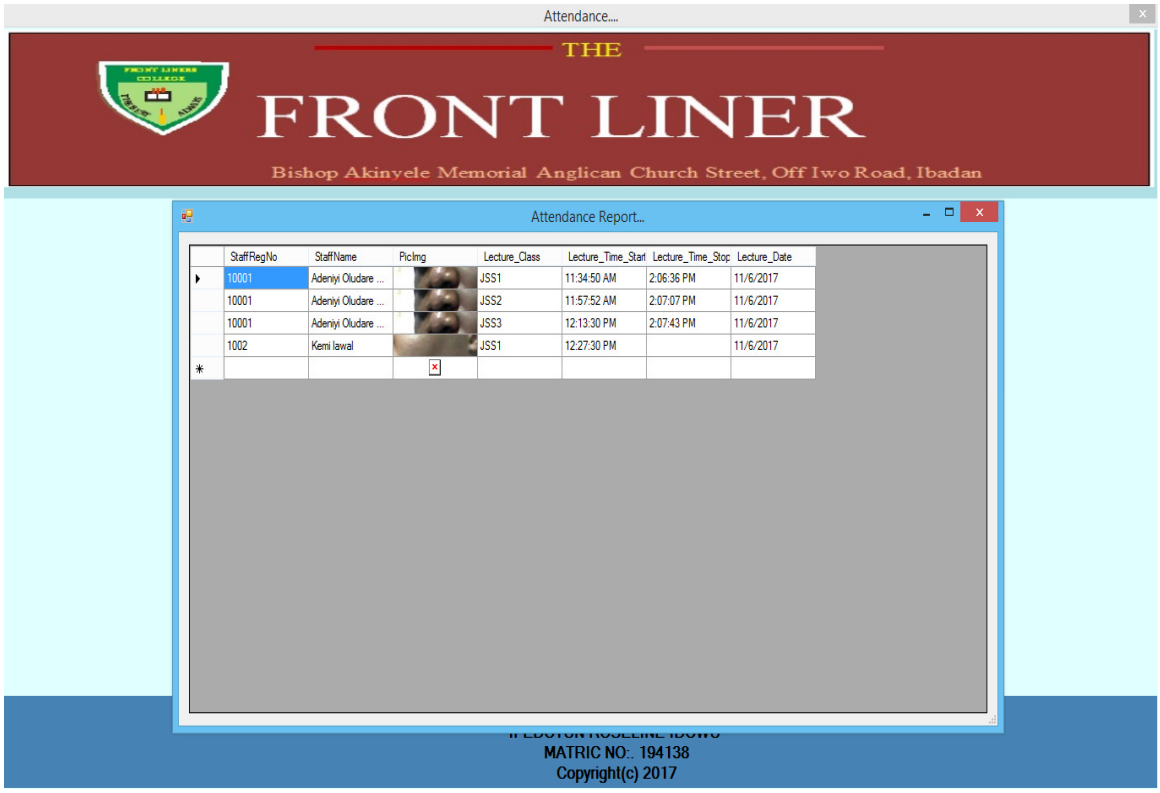

Fig 4: Report interface of attendance Management System

4. Empirical Analysis of the Attendance Management System

The empirical analysis of the system involves the conversion of manual procedures into automated ones. In the case of this research, the conversion includes the pen-wise attendance register to the fingerprint-based format. Data was entered into the system via the keyboard.

4.1: Workload Performance Analysis of the Developed System

Workload is the amount of work to be done, especially by a particular person or machine in a period of time. Teachers are always complaining about their heavy workloads .Students do find that their workload increases throughout the course. With the constant workload and harsh working conditions, employees can easily become short-tempered. He recovers from his heart attack, and under reduced workload, returns to work alongside the team.. Different methods of distributing the workload tend to favor one type of scaling over the other. Benchmarks are designed to mimic a particular type of workload on a component or system. A statistic on the number of inputs gathered by a system and the number of outputs produced by a system over a particular duration of time determines the workload. Table 4.1 shows the Database Reoprt of the Sttaff Attendance Management system

Table 4.1 shows the Database Reoprt of the Sttaff Attendance Management system

	StaffRegN	StaffName	Lecture_Class		Lecture_Time_Start	Lecture_Time_Stop	AVG DURATION
2	0110	SOLA	JSS1		8:32	10:07	1:35
3	0110	SOLA	SSS3		2:36	4:13	1:37
4	0110	SOLA	SSS1		10:34:50 AM	11:40:29 AM	1:05
5	0110	SOLA	SSS3		10:03:47 AM	11:16:05 AM	1:12
6	0110	SOLA	SSS1		2:39:02 PM	4:02:53 PM	1:23
7	0110	SOLA	JSS2		9:03:41 AM	10:21:08 AM	1:17
8	0110	SOLA	JSS3		8:45:23 AM	10:02:40 AM	1:17
9	0110	SOLA	JSS1		2:10:52 PM	4:08:43 PM	1:57
10	0110	SOLA	SSS1		10:34:04 AM	11:39:46 AM	1:05
11	0110	SOLA	SSS3		10:05:19 AM	11:15:37 AM	1:10
12	0110	SOLA	SSS1		2:32:31 PM	4:01:55 PM	1:29
13	0110	SOLA	JSS2		9:03:51 AM	10:20:31 AM	1:16
14	0111	AGNES	SSS3		8:37:31 AM	10:01:54 AM	1:24
15	0111	AGNES	JSS2		8:30:03 AM	9:34:05 AM	1:04
16	0111	AGNES	JSS3		9:08:07 AM	11:05:35 AM	1:57
17	0111	AGNES	SSS3		2:03:14 PM	4:05:25 PM	2:02
18	0111	AGNES	JSS2		8:30:30 AM	9:35:04 AM	1:04
19	0111	AGNES	JSS3		9:07:42 AM	11:04:11 AM	1:56
20	0113	ADENIYI	SSS3		8:26:39 AM	9:26:45 AM	1:00
21	0113	ADENIYI	SSS2		2:38:36 PM	4:08:22 PM	1:29
22	0113	ADENIYI	JSS1		12:37:52 PM	2:30:27 PM	1:52
23	0113	ADENIYI	SSS3		9:07:04 AM	10:15:19 AM	1:08
24	0113	ADENIYI	SSS3		8:27:48 AM	9:27:40 AM	0:59
25	0113	ADENIYI	SSS2		2:38:11 PM	4:07:34 PM	1:29
26	0113	ADENIYI	JSS1		12:35:28 PM	2:30:11 PM	1:54
27	0113	ADENIYI	SSS3		9:06:06 AM	10:15:48 AM	1:09
28	0115	ADERONKE	SSS2		12:32:44 AM	2:29:16 PM	13:56

Table 4.2 :Sign in/Sign out Breakdown of Analysis for Each Class

Lecture_Class	JSS1
Row Labels	Count of Lecture_Class
ABOSEDE	1
ADENIYI	2
Adeniyi Oludare Emmanuel	1
ADEOTI	1
JAMES	2
Kemi lawal	1
MOSUNMADE	3
SEWA	1
SOLA	2
Grand Total	14

Lecture_Class	JSS2
Row Labels	Count of Lecture_Class
Adeniyi Oludare Emmanuel	1
ADEOTI	2
ADERONKE	2
AGNES	2
MOSUNMADE	1
OSO	2
SOLA	2
Grand Total	12

Lecture_Class	JSS3
Row Labels	Count of Lecture_Class
Adeniyi Oludare Emmanuel	1
ADERONKE	1
AGNES	2
AKINPELU	2
SOLA	1
Grand Total	7

Lecture_Class	SSS1
Row Labels	Count of Lecture_Class
ABOSEDE	5
ADEOTI	5
AKINPELU	4
MOSUNMADE	2
OSO	4
SOLA	4
Grand Total	24

Lecture_Class	SSS2
Row Labels	Count of Lecture_Class
ADENIYI	2
ADEOTI	2
ADERONKE	1
AKINPELU	2
JAMES	2
MOSUNMADE	3
Grand Total	12

Lecture_Class	SSS3
Row Labels	Count of Lecture_Class
ABOSEDE	2
ADENIYI	4
ADEOTI	2
ADERONKE	2
AGNES	2
JAMES	2
MOSUNMADE	1
OSO	2
SOLA	3
Grand Total	20

Table 4.3: Analysis of Number of Sign in/Sign Out for Each Teacher

Staff Name	No of Logins
SOLA	12
AGNES	6
ADENIYI	8
ADERONKE	6
MOSUNMADE	10
AKINPELU	8
ADEOTI	12
JAMES	6
OSO	8
ABOSEDE	8
Adeniyi Oludare	3
Kemi lawal	1
SEWA	1

1	Lecture_Class	(All)
2		
3	**Row Labels**	**Count of Lecture_Class**
4	ABOSEDE	8
5	ADENIYI	8
6	Adeniyi Oludare Emmanuel	3
7	ADEOTI	12
8	ADERONKE	6
9	AGNES	6
10	AKINPELU	8
11	JAMES	6
12	Kemi lawal	1
13	MOSUNMADE	10
14	OSO	8
15	SEWA	1
16	SOLA	12
17	**Grand Total**	**89**

The explanation for the various modules in the system is to illustrate the capabilities of the system when interracting with prospective users . The functionalities of the user interface must be considered..Table 4,4 provide the summary of Class taken by Each Teacher Per Hour, Fig 4.2: classify the data class per hour in a Bar Chart For Each Class Per Hour.

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Table 4.4: Summary of Class taken by Each Teacher Per Hour

1								
2								
4	**Row Labels**	**JSS1**	**JSS2**	**JSS3**	**SSS1**	**SSS2**	**SSS3**	**Grand Total**
5	ABOSEDE	1			5		2	8
6	ADENIYI	2				2	4	8
7	Adeniyi Oludare Emmanuel	1	1	1				3
8	ADEOTI	1	2		5	2	2	12
9	ADERONKE		2	1		1	2	6
10	AGNES		2	2			2	6
11	AKINPELU			2	4	2		8
12	JAMES	2				2	2	6
13	Kemi lawal	1						1
14	MOSUNMADE	3	1		2	3	1	10
15	OSO		2		4		2	8
16	SEWA	1						1
17	SOLA	2	2	1	4		3	12
18	**Grand Total**	**14**	**12**	**7**	**24**	**12**	**20**	**89**

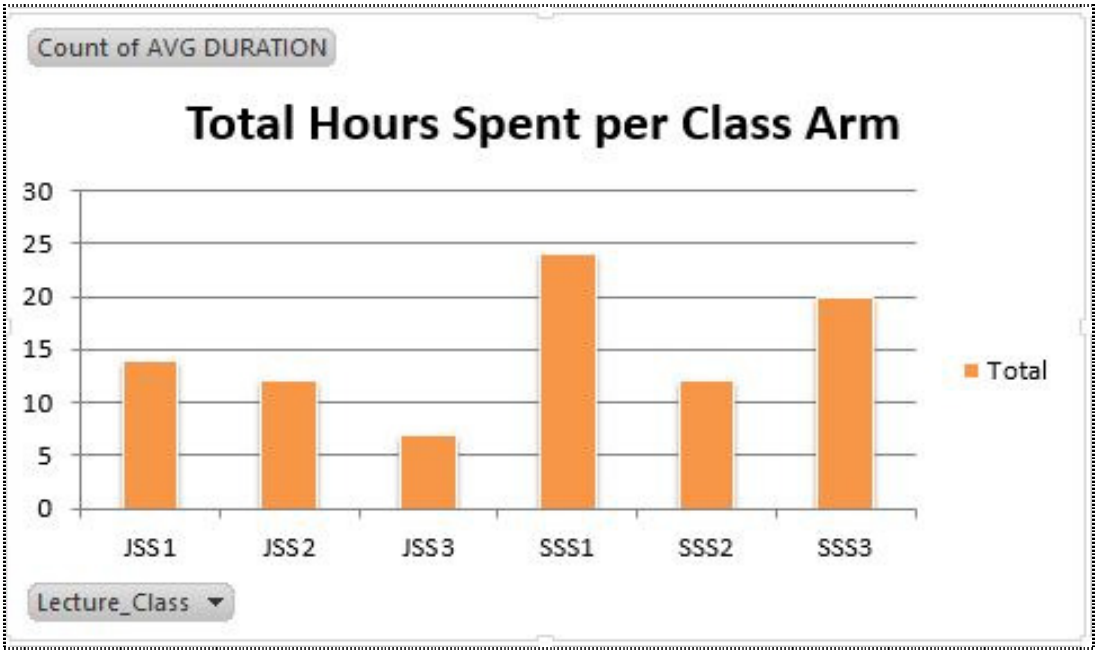


Fig.4.2:Bar Chart For Each Class Per Hour

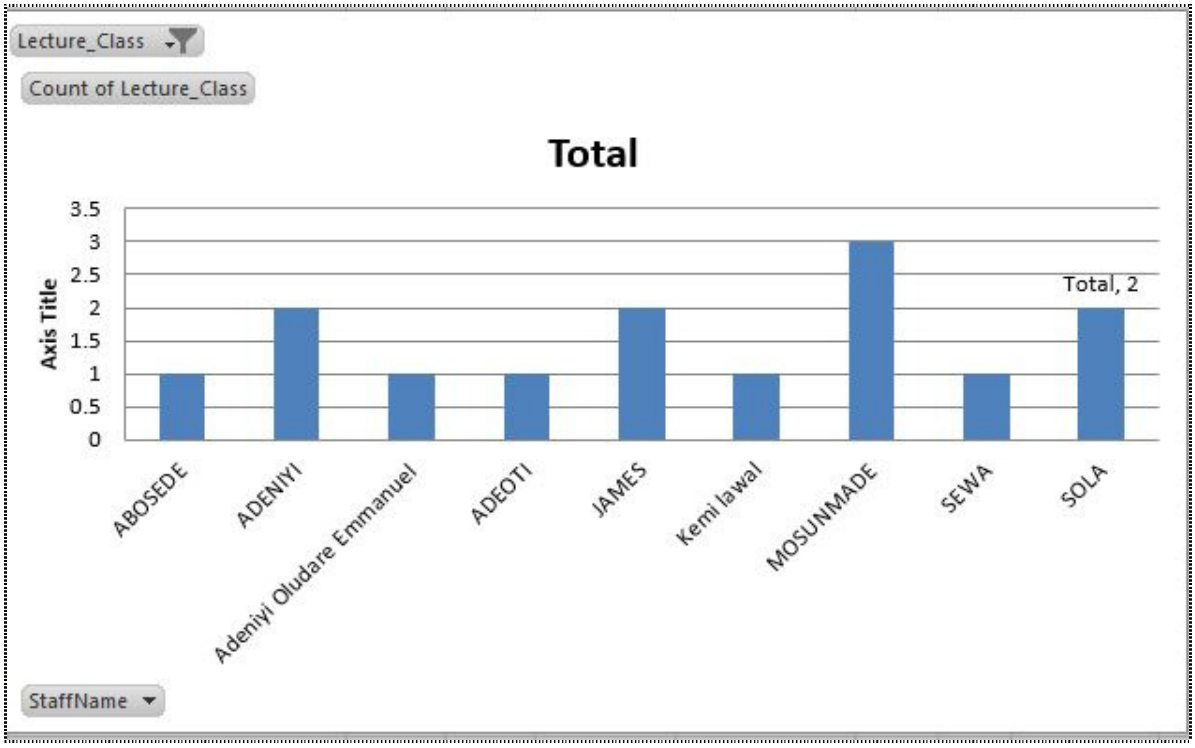


Fig. 4.3: Bar Chart For Each Teacher Per Hour

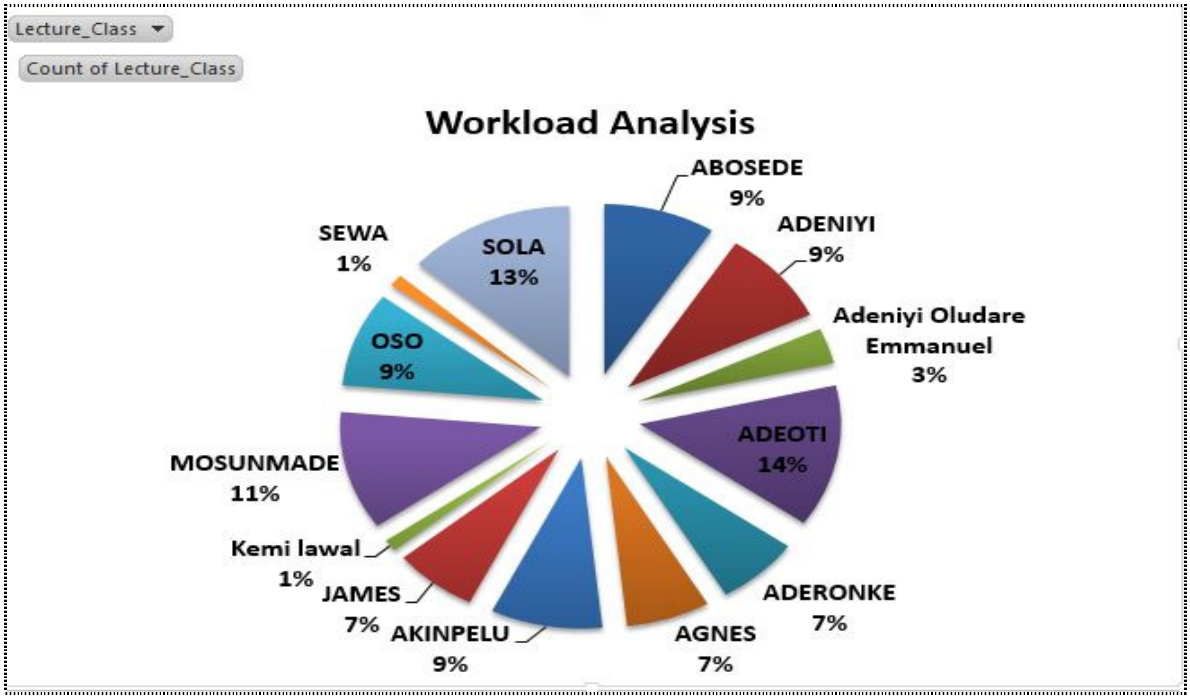
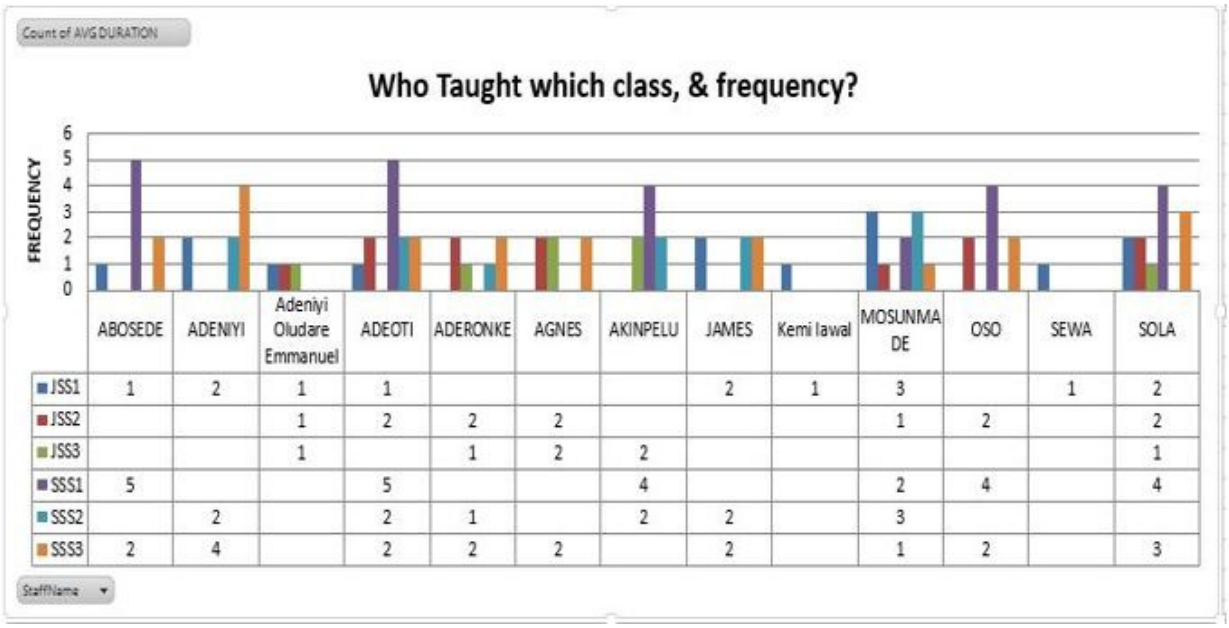


Fig.4.4:% Workload Analysis for Each Staff



	ABOSEDE	ADENIYI	Adeniyi Oludare Emmanuel	ADEOTI	ADERONKE	AGNES	AKINPELU	JAMES	Kemi lawal	MOSUNMADE	OSO	SEWA	SOLA
JSS1	1	2	1	1				2	1	3		1	2
JSS2			1	2	2	2				1	2		2
JSS3			1		1	2	2						1
SSS1	5			5			4			2	4		4
SSS2		2		2	1		2	2		3			
SSS3	2	4		2	2	2		2		1	2		3

Fig.4.5:Overall Breakdown of Attendence

4.3: Discussion of Results

The results shown in the study classify the performance rate of the system using the various classes as follows: SSS1 with 27%,SSS3 with 22%,JSS1 16%, JSS2 as 14%,SSS2 as 13% and JSS3 as 8%. Also the in above chart and figures provides vital information derived formula for maximizing teacher's performance on students as teacher's well-being when assigning teaching and non-teaching duties to teachers. Attention should be given to JSS3 because of the low output.

5. CONCLUSIONS

The system removes the limitation of having the attendance records restricted to one computer, thus a supervisor or any authorized personnel can check the attendance record when needed. It reduces a HR practitioner's workload by automating the attendance system. The developed system consider the **indirect** costs of staffing, scheduling, re-training, lost productivity, diminished moral, turnover, and opportunity cost. The indirect costs often exceed the direct cost of absenteeism.. The above chart and figures provides vital information derived formula for maximizing teacher's performance on students as teacher's well-being when assigning teaching and non-teaching duties to teachers. There is need for computer-based attendance management system which will assist the management for maintaining attendance of presence

Acknowledgments

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