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An Efficient Personal SMS Reminder System Using Modified Wave Scheduling Algorithm

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ABSTRACT: Reminder systems have become increasingly popular among individuals over the last decades, which serve as the cutting edge of information system technology. Reminder programs aid individuals and organizations to meet up pre-planned tasks or activities with time management report tools. The problem of the reminder system due to the manual function used is lack of accuracy, time-consuming, security challenges, and no alerts/SMS possible with the existing system. Updating involves cancellation, and costly to dispose of. Object-oriented analysis and design methodology (OADM) is used to develop the proposed system. We proposed an automated reminder system to solve the existing system drawbacks, which is faster and efficient. The implications of the findings show that when appointment scheduled with respect to date and time clashes with reality, customers/clients are liable to arrive late and emergency cases occur. If we have a wave of appointments waiting/pending and more are added to the pool, this method of scheduling does not take into account who might need to be seen on an emergency basis and also adding an appointment submission to a full schedule always means that the schedule will backup later, causing the customer to wait for an unacceptable date/time. The proposed system or application will be implemented using Visual Basic 2010 (VB.NET) programming language and MYSQL database application to solve the manual system.

KEYWORDS: Reminder System, SMS, Schedule, Algorithms, Alerts.

I. INTRODUCTION

Every day, individuals worldwide go about their various activities in their unique ways. Some of these individuals employ Information Technologies to aid in the smooth running of their businesses. A Reminder System uses technology to aid our memory to recall information of choice.

Time is a limited resource and is scarce as it cannot be created or bought to increase one's allocation. Consequently, making efficient use of one's time is essential.

Before the rise of technology, people depend solely on their memory to know what they have planned or intended to achieve at a set time. There is a tendency that they will forget certain things. Various ways were devised to aid one's memory in recalling pre-planned activities.

Some began using Diary or Journal to aid their memory. This method added additional workload as they would have to read this diary to know what was planned/scheduled for a specific date/time and have to update the diary with information as days go by.

In as much as these ways provided an improved way of keeping track of events, it is still inefficient and not security conscious. As recording sensitive information like Trade Secrets on Diary or Journal Entry is open to theft. They can be lost when not properly kept.

In order to keep the content of the journal away from prying eyes, various ways were employed, which among them are:

1. The use of abbreviations or shorthand: Using abbreviations only known to you would help confuse others, should they read the diary. A simple example would be if you were writing about a particular negative situation or thought.
2. Using a unique diary with locks: Some diaries are equipped with locks and keys. Using such a diary makes it impossible for it to be useful should it fall into the wrong hands.
3. Adding a Warning Page: Adding a page asking people not to go through the content of the diary and hoping on the goodwill that they would not.
4. Destruction of Old Diary: After a diary has been used up, to prevent the content from falling into the wrong hands, such a diary would be destroyed by burning it with fire.
5. Caesar's Cipher: This is an encryption algorithm believed to have been used by Julius Ceaser; hence, it was named after him. It is a type of substitution cypher in which each letter in the plaintext is replaced by a letter and some

fixed number of positions down the alphabet. For example, with a left shift of 3, D would be replaced by A, E would become B, and so on.

Providing a secure and reliable method of aiding one's memory to recall information of choice is the bane of this project research.

II. RELATED WORK

A. Overview of Reminder System

In almost every aspect of our daily lives, we have queued events and we are confronted with timing all queued events. In time management, it is better to keep track of things using a system rather than your memory [1]. A Reminder System software programs are at the cutting edge of information systems technology. Reminder System programs aid individuals and organizations to meet pre-planned tasks, activities, or events with time management reporting tools. Reminder System software supports the efficient management of an individual's time and resources.

B. Concept of a Reminder System

Reminder System is a system used to prompt or aid the memory. The systems can be computerized, colour-coded, timed telephone calls, or devices such as letters and postcards.

Computer-based Reminder System is a type of time management computer software that is designed to alert the user of important events that they have input to the program. Most programs provide a calendar and/or list view of events, as well as a reminding technique. Most common reminding techniques are pop-up dialog boxes and auditory alarms. Events may include birthdays, holidays, anniversaries, various one-time events. Often the software comes with a set of pre-installed events (such as holidays) and allows the user to create custom events [2].

As software gradually makes the transition to web services, online reminder services have appeared allowing users to subscribe to them and then receive their reminders by SMS. A recurring theme in time management is that it is better to keep track of things using a system rather than your memory. This best practice deals with all the other things that you may need to remember such as appointments, meetings, time-sensitive paperwork, deadlines [3].

C. Tools for Reminder System

The following are tools for the reminder system as discussed;

Calendar: A calendar is a very useful tool to remind you about specific events such as appointments, meetings, and deadlines. It is also very good for scheduling or blocking out certain times for working on specific projects/tasks or other activities. Having said that, the calendar is not the appropriate place to manage your projects and tasks. Many people that do not use a master project and task list use their calendar to record and manage what they need to do.

Checklists: Checklists are another useful tool to help you remember important details without having to rethink them each time you perform some task. Airline pilots make extensive use of checklists to make sure they have covered all the important details during takeoff and landing, which are the two most complex and stressful tasks associated with flying. A well-designed checklist promotes consistent quality irrespective of who is doing the work and can be used to detect and correct common errors and problems quickly and effectively.

Cheat Sheets: Cheat sheets are used to help you remember the information you use regularly without having to rely on your memory alone. If you find yourself looking up the same information repeatedly, a cheat sheet is a useful tool for collecting this information in a format that is more accessible and easier to search.

D. Location Based Task Reminder System Using Android Mobile

In today's era of smartphones, everybody is connected to smartphones, there are so many applications on Android smartphones to complete user's necessary task in daily life as we consider the task of the user that he or she has to perform some task on particular location as soon as user will reach that specific location. Normally, the user forgets this kind of stuff in daily busy life to remember the location and what task he or she has to do. It is very complicated for the user who has to travel through several locations in daily life. In order to solve this problem, we developed the system called "Location Based Task Reminder System Using Android Mobile" in this system we are fetching the user's current location through android mobile phones using Google Map, GPS and allow them to set a reminder about that task on that specified location. In this way user can add multiple task reminders at multiple locations this will make effective for the users [4].

E. Smart Reminder Application with GPS System

In today's life, everyone is using a smartphone. This application also provides location-based reminder module. The main purpose of this application is to allow users to create reminders based on the location and notify users with those reminders automatically. First, the user tags the locations using applications such as Google Maps or manually; then creates reminders for the tagged locations and when he/she gets close to this location, the system notifies the user. In addition, the location-based reminder changes the profile according to the location e.g. at noise restricted area the profile should be silent. The application is altered from similar type of applications with its enhanced location tagging feature and conversion of text notification into voice. The usability test results will show that our application is an effective reminder application to remember the essential things [5].

III. ANALYSIS

A. Analysis of the Present System

System analysis/investigation and design of the proposed system are necessary in order to produce the required system needed for the effective running of the personal reminder system. Imperatively, the boundary of the new system and its limitation are also produced to see its measure of effectiveness and ineffectiveness by its relationship either with other applications and users (business owners/managers and customers/clients in our society/organization). A system can be defined as working together harmoniously of different part, units or element towards achieving common goals and objectives. While Analysis is defined as the collection, organization and evaluation of fact a system or a problem and the environment in which it operates.

Therefore, system analysis is a way of diagnosing an existing system and finds the solution to the problems that arises. To make the system meets the goals and objectives of the people.

B. Analysis of the Proposed System

A modified wave appointment scheduling algorithm is a proposed approach for personal appointment reminder scheduling in which appointments/events are scheduled. In order to overcome the disadvantages of the existing system, the modified appointment algorithm notification is hereby adopted. The scheduling system of the study receives a stream of appointment submissions as data and produces into valid scheduling. In addition, the arrival of any specific data is not necessarily predictable, that is, the scheduling system may not be aware of any appointment arriving on later date or time.

1) Scheduling Policy

The scheduling policy forms the top level and is needed by the owner or user. In general, the scheduling policy is a collection of rules to determine the resource allocation if not enough resources are available to satisfy all requests immediately.

Furthermore, we do not specify the amount and the type of appointment submitted. Different scheduling systems may accept or require different sets of data submission. For us, submission appointments comprise all data, which are used to determine a schedule. However, a few different categories can be distinguished:

1. User Data: These data may be used to determine appointment priorities. For instance, some of the appointments waiting with a higher priority may receive faster service at a specific time than other appointments/events

2. Resource Requests: This specifies the resources required for the system to schedule an appointment/event using the modified scheduling algorithm. Often, they include the hardware, software, storage, appointment priority and time.

3. Scheduling Objectives: This helps the scheduling system to generate 'good/reliable' appointment schedules. For instance, a user may state that he/she want to attend an appointment/event by 8am the morning and receives an appointment alert after 8am may shows some sort of being not serious to his customers/clients to make transactions. Appointment submissions as data are entered by the user and typically provided to the system when an appointment is submitted for scheduling.

2) The Modified Wave Scheduling Algorithm

Wave scheduling is a method of scheduling appointments in which several appointments/events are given appointment time in the order in which they arrived. The modified wave scheduling algorithm with or without the use of predecessor and successor forces the same WAVE. For scheduling WAVE in a given time, the scheduler requires multipliers. This means that WAVE can be scheduled with multipliers and adder in respect to date/time. The results of scheduling WAVE with respect to date/time show that the algorithm with or without predecessor and successor forces a lot of execution time than the algorithm without those forces. This was to be expected from the previously stated order of the algorithm. The modified wave approach was used to schedule appointments as an alternative to the steady stream and

the pure wave methods; with this approach, more than one appointment is scheduled at the beginning of each hour and the end of the hour is left open, enabling the user and customers to catch up on the appointment, if necessary.

3) The Appointment Scheduling Algorithm

Step 1: Create Future Appointment List (FAL)

- (a) All appointment notices should be chronologically ordered in the FAL
- (b) At current time t , the FAL contains all scheduled appointments
- (c) The appointment times satisfy $t < t_1 \leq t_2 \leq t_3 \leq \dots \leq t_n$
- (d) The appointment associated with t_1 is the imminent event, i.e., the next event to occur

Step 2: Create a Schedule of an appointment

- (a) At the beginning of an activity, the duration is computed and an end-of-activity appointment is placed on the Appointment list

Step 3: Remove the appointment notice for the imminent event from FAL

Step 4: Advance clock to imminent event time

- (a). Set clock - t_1

Step 5: Execute imminent appointment

- (a). Update system state
- (b). Change entity attributes
- (c) Set membership as needed

Step 6: Generate future events and place

- (a) Appointment($4, t^*$)

Step 7: Update statistics and counter

Step 8: Schedule appointments at registration time

- (a) if the registration time is earlier than 72 hours from the event then schedule a notification (reminder date - 72 hours) and queue it
- (b) if the registration time is earlier than 48 hours from the event then schedule a notification (reminder date - 48 hours) and queue it
- (c) if the registration time is earlier than 24 hours from the event then schedule a notification (event date - 24 hours) and queue it.

This should cover the following scenarios:

If the modified waveform approach is used for scheduling a personal reminder system, the provider is allotted with more than one appointment at the beginning of each hour and the end of the hour is left open.

C. Methodology

Object-oriented analysis and design (OAD) is often part of the development of large-scale systems and programs often using the Unified Modeling Language (UML). OAD applies object-modelling techniques to analyze the requirements for a context, for example, a system, a set of system modules, an organization, or a business unit and to design a solution. Most modern object-oriented analysis and design methodologies are use case driven across requirements, design, implementation, testing, and deployment.

D. Use Case Diagram

Figure 1 shows the use case diagram indicating that a user can Create/Edit/ View/Delete information from the database and send reminder notifications as SMS but the user need to login to the system. The system provides authentication to ensure that only correct login data has access to the system. If successful, then the user proceeds to create/view/edit Personal Reminder information available.

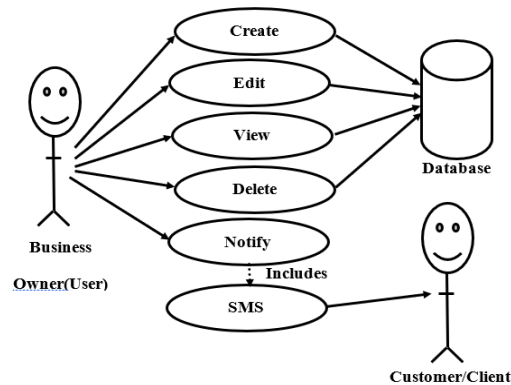


Figure 1. Use case diagram of the proposed system

E. Class Diagram

The class diagram for the proposed system (Personal Reminder System) shows exactly the way our software object appears containing class name with their properties/attributes of the class/characteristic of the class and actions the classes can perform. Class and object diagrams are static model views. Sequence diagrams are dynamic and describe how objects collaborate. The above class diagram gives an overview of a system by showing its classes and the relationships among them. Class diagrams are static they display what interacts but not what happens when they do interact.

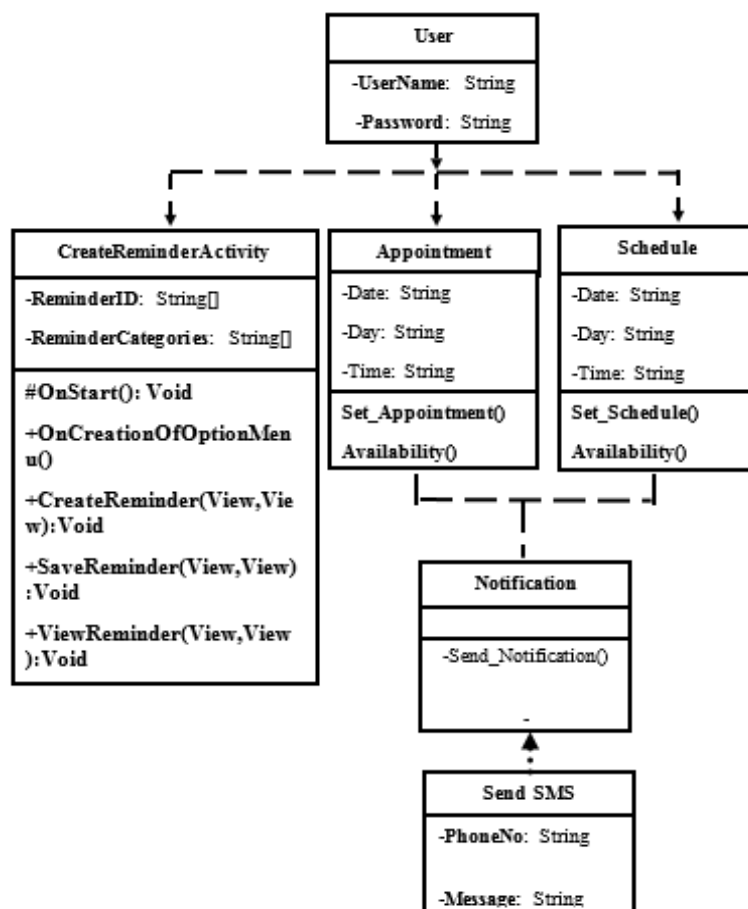


Figure 2. Class Diagram

F. Sequence Diagram

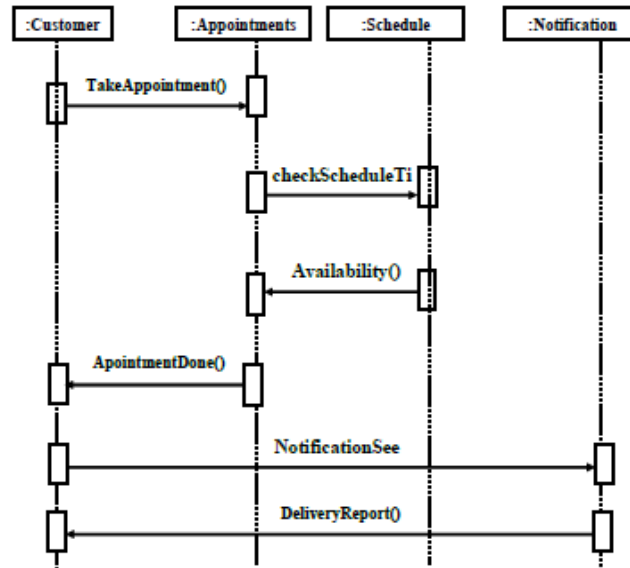


Figure 3. Customer making an appointment

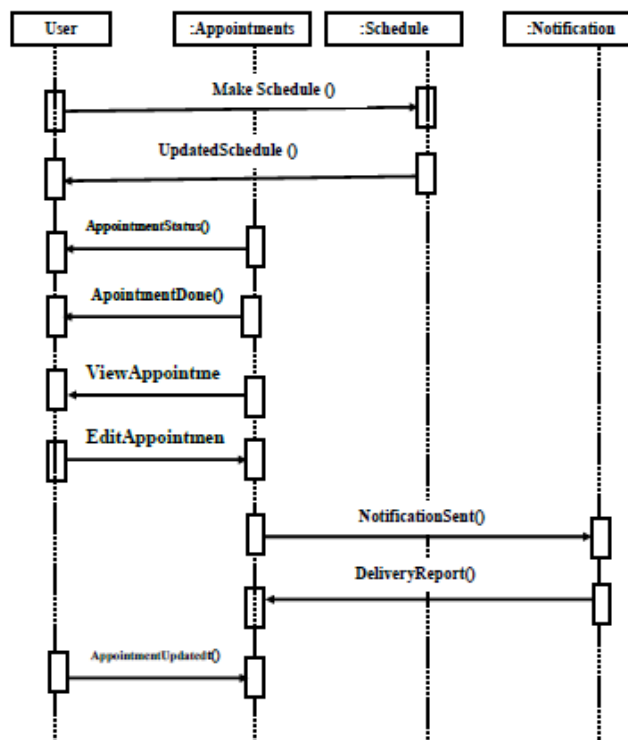


Figure 4. User setting a schedule and get status update

Figure 3 and 4. shows the sequence diagram of a user/customer to make an appointment and get status update

G. Activity Diagram

Figure 4. shows the activity diagram of an appointment reminder system. It is the activity diagram for user, which means the above shows the various activities that are performed by Users. The User login to the system and he/she is authenticated by the system. Then he/she is able to create and view information available in the system, which the

system shows. Personal reminder/events can be added by the user, which the system creates. Finally, the user can update or delete reminder created as needed from the application.

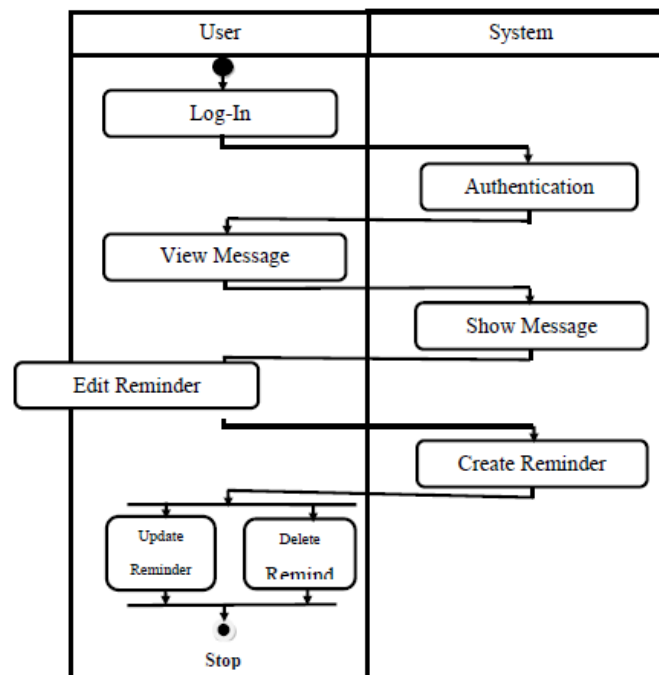


Figure 5. Activity Diagram

IV. DISCUSSIONS

The Modified wave scheduling algorithm of the study receives a stream of appointment submissions/customers records as data from the user and produces a valid appointment schedule with the help of scheduling policy as a rule to determine the resource allocation to know if there are enough resources available to satisfy all requests immediately. With the Modified wave scheduling algorithm more than one appointment was scheduled at the beginning of each hour and the end of the hour is left open, enabling the user and customers to catch up the other appointments, if necessary

Figure 6 shows the interface presenting each field that will be required to fill for customer/Appointment submissions as data. After capturing customer details, user can proceed to the next person, simply click the Add New button to create empty fields to receive appointment submission as data and ensure to click Submit to save the customer/client record. Click Edit button to edit any selected person and Delete to remove the details from the group captured. The Input form, gives the user the privilege to add, remove and edit customers records in the entire personal reminder system. Also it gives a list of all the customers in the database at any given time through the first(<<), previous(<), next(>) and last(>>) navigators. This privilege is restricted to only the user.

Figure 7 shows the Appointment submission report of all the registered customers in the database as data captured from the keyboard supplied by the user. The details include Customer/Client Name, Customers ID, Gender, Phone Number, E-mail Address, Customers Address, Occupation and State of Origin showing the number of registered customers/appointment submissions as report. This is the section that displays the list of registered customers eligible to receive SMS/text and E-mail message with their customer ID with the system.

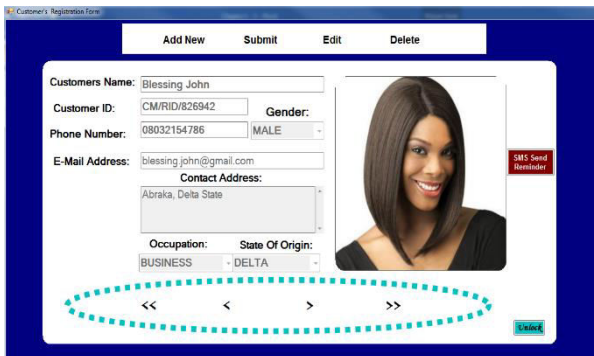
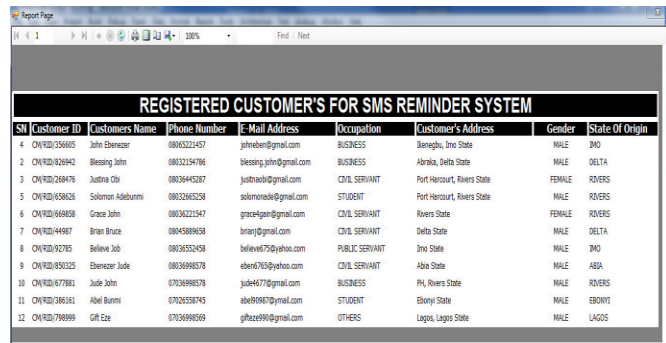
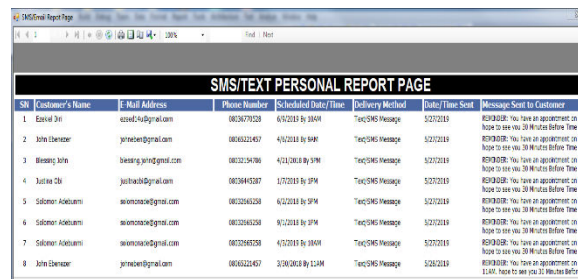


Figure 6. Input interface



SN	Customer ID	Customers Name	Phone Number	E-Mail Address	Occupation	Customer's Address	Gender	State Of Origin
4	CM/RID/25665	John Ebenezer	08063221457	johneneb@gmail.com	BUSINESS	Ikennege, Iwo State	MALE	IMO
2	CM/RID/26942	Blessing John	08032154786	blessing.john@gmail.com	BUSINESS	Abiraka, Delta State	MALE	DELTA
3	CM/RID/268476	Justina Olu	08034443387	justinad@gmail.com	CIVIL SERVANT	Port Harcourt, Rivers State	FEMALE	RIVERS
5	CM/RID/458626	Solomon Adabunmi	0803265258	solomonad@gmail.com	STUDENT	Port Harcourt, Rivers State	MALE	RIVERS
6	CM/RID/458626	Grace John	0803221547	gracejohn@gmail.com	CIVIL SERVANT	Rivers State	FEMALE	RIVERS
7	CM/RID/44987	Brian Bruce	08045889658	brianj@gmail.com	CIVIL SERVANT	Delta State	MALE	DELTA
8	CM/RID/932785	Bellewa Job	08038352458	bellewa75@yahoo.com	PUBLIC SERVANT	Iwo State	MALE	IMO
9	CM/RID/93225	Ebenzer Jude	0803898878	ebenzer76@yahoo.com	CIVIL SERVANT	Abia State	MALE	ABIA
10	CM/RID/677861	Jude John	07036996578	jude477@gmail.com	BUSINESS	PH, Rivers State	MALE	RIVERS
11	CM/RID/286161	Abel Summi	07025558745	abel90987@gmail.com	STUDENT	Ebonyi State	MALE	EBONYI
12	CM/RID/79899	Off Eze	0703699658	gftaze98@gmail.com	OTHERS	Lagos, Lagos State	MALE	LAGOS

Figure 7. Customer Report



SN	Customer's Name	E-Mail Address	Phone Number	Scheduled Date/Time	Delivery Method	Notification Time	Message Sent to Customer
1	Esther Jiri	estherjiri@gmail.com	08036770328	6/2/2018 By 10AM	Text/SMS Message	5/27/2018	REMINDER: You have an appointment on 6/2 Hope to see you 30 Minutes Before Time
2	John Ebenezer	johneneb@gmail.com	08063221457	4/2/2018 By 9AM	Text/SMS Message	5/27/2018	REMINDER: You have an appointment on 4/2 Hope to see you 30 Minutes Before Time
3	Blessing John	blessing.john@gmail.com	08032154786	4/21/2018 By 9PM	Text/SMS Message	5/27/2018	REMINDER: You have an appointment on 4/21 Hope to see you 30 Minutes Before Time
4	Justina Olu	justinad@gmail.com	08034443387	1/7/2018 By 9PM	Text/SMS Message	5/27/2018	REMINDER: You have an appointment on 1/7 Hope to see you 30 Minutes Before Time
5	Solomon Adabunmi	solomonad@gmail.com	0803265258	6/2/2018 By 9PM	Text/SMS Message	5/27/2018	REMINDER: You have an appointment on 6/2 Hope to see you 30 Minutes Before Time
6	Solomon Adabunmi	solomonad@gmail.com	0803265258	9/1/2018 By 9PM	Text/SMS Message	5/27/2018	REMINDER: You have an appointment on 9/1 Hope to see you 30 Minutes Before Time
7	Solomon Adabunmi	solomonad@gmail.com	0803265258	4/1/2018 By 10AM	Text/SMS Message	5/27/2018	REMINDER: You have an appointment on 4/1 Hope to see you 30 Minutes Before Time
8	John Ebenezer	johneneb@gmail.com	08063221457	3/04/2018 By 11AM	Text/SMS Message	5/28/2018	REMINDER: You have an appointment on 3/4 Hope to see you 30 Minutes Before Time

Figure 8. SMS Report

V. CONCLUSION

The public (marketers, private and non-private companies etc) finds it difficult to reach their clients through variety of communication mediums or strategies including text message and e-mail appointment reminders. Such strategies are certainly made easier and possible with the personal reminder notification system by using the modified wave scheduling algorithm in which it would be fairly easy and inexpensive to send a text message reminders to remind customers/clients. To ensure effective use of personal reminder system, Private, non-private and the general public or organizations need to have policies in place to collect data and verify processes to ensure that customers' contact information is correct thus allowing them to receive reminders. Future research is required to address how to "personalize" reminder systems to maximize effectiveness as well as the cost-effectiveness of such a personalized reminder strategy.

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